NORTHUMBERLAND SEA FISHERIES COMMITTEE.

REPORT on the Scientific Investigations

For the Year 1901.

EDITED BY ALEXANDER MEEK, M.Sc., F.Z.S.,

MARINE LABORATORY, CULLERCOATS, AND THE DURHAM COLLEGE OF SCIENCE, NEWCASTLE-UPON-TYNE.

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SUMMARY AND GENERAL REPORT.

The following report, which I have the honour of submitting, deals with the scientific investigations for the year ending 17th October, 1901.

As the **trawling excursions**, instituted by Ald. Dent in 1892, have now been conducted for ten years, I have prepared tables showing the results for the whole period, and also the average catches obtained during the first five years as compared with the second five years. These show that in all the bays, with the exception of Skate Roads, there has been a fairly steady improvement. **Plaice** have been increased in numbers to a slight extent. **Dabs** have conspicuously improved in numbers. **Turbot** seem to be just about as numerous to-day as when the experiments were started. **Brill** appear to be becoming more numerous. **Soles**, however, are diminishing in numbers.

This year **plaice** reach the average of 130, the highest yet recorded. **Dabs**, with an average of 73, show a decrease compared with the three previous years, but an increase over all the years, 1892-97. **Turbot** give an average of 6 as compared with 4 in 1900. **Soles** present an average of 7, as compared with 14 in 1900. The total catches of **flat fishes** average 211, which is below the average recorded for the preceding five years.

Tables are given showing the condition of the white fishing at North Shields, and for the rest of the district not including North Shields. These show that while the quantity of fish landed at North Shields is steadily increasing, that of the fishing villages presents a startling decrease.

A complete statement is given with measurements of all the fishes captured in the first haul at the trawling excursions.

Details are given likewise as to maturity and the nature of the food of the fishes captured at the excursions.

The general results of the investigations made this season on the floating life and the animals which live at the bottom in the places visited by the "Stanley" and the coble are presented in tabular form (table 8).

Miss Lebour continues the list of Mollusca in a paper dealing with some interesting finds obtained for the most part at the excursions this year. I beg to offer, also, a preliminary paper on the Marine Amphipoda of Northumberland.

A meeting was held at North Shields early in the year with reference to the proposed attempt to get the captains and crews of trawl fishing boats to artificially fertilize and return to the water the ripe ova of the fishes during the spawning season. Certain of the captains attended the laboratory at Cullercoats and received instruction on the subject and also as to the life-histories of the food fishes. A pamphlet was published and circulated amongst the crews likewise. Many of the captains carried out the instructions, and we estimate that during the last spawning season at the very least some 500,000,000 fertilized ova of cod and plaice were returned to the sea.

The question of the chance of recovery of fishes captured in the trawl and returned to the sea is discussed in a short article.

The experiments with mussels on the Coquet showed that such places are capable of development for the supply of mussel bait to the fishermen.

Tables showing the catches of crabs and lobsters are again contributed by Messrs. Fawcus and Douglas.

Conferences were this year held at certain of the southern villages. The recommendations made by the fishermen deserve the careful consideration of the Committee.

The laboratory was utilised this year by Miss K. A. Smith, Birmingham, and by Mr. W. T. Gibson, London.

Alexander Meek.

THE TRAWLING EXCURSIONS.

The Steamer "Stanley."—We have to thank Ald. Dent, Chairman of the Northumberland Sea Fisheries' Committee, for devoting this year his new paddle steamer the "Stanley" to the work of the trawling excursions. The "Livingstone" was a very good boat for the purpose, but the "Stanley" possesses many advantages for facilitating the investigations derived from the experience of past years. The "Stanley" measures 108 feet 3 inches by 18 feet 8 inches by 10 feet, and is therefore a much larger boat. Her tonnage is registered as 164 gross, 34 net, and she is provided with engines of 99 h.p. The cabin accommodation is such as to make it easy to spend days if necessary at sea. A powerful steam winch and davits make the work of hauling in the trawl and dredges very light indeed. We had the opportunity of judging of her capabilities this summer not only at the trawling excursions but also by means of a grant to Dr. Brady from the Royal Society at a two days' dredging excursion, and the results, we have no hesitation in saying, justify the statement that no better boat is used for marine research in this country.

THE MARKETABLE FISHES CAPTURED.

The results of this year's trawling experiments are detailed as in previous years in table 1. This table gives the numbers of the keepable or marketable fishes caught at each excursion, and before discussing the table and the results of ten years' experiments a few notes are offered on the general observations made at the excursions.

Skate Roads, June 20th.—The wind was westerly in the morning changing o southerly in the evening, when a brisk breeze was blowing; the day was dull. There was a good deal of weed in the bay, but fortunately not so much as altogether to prevent fishing as was the case last year. The fish have evidently

a variable power of changing colour under such conditions. The plaice and gurnards especially could be divided into two lots, (1) black or sub-black and (2) the usual light brown colour. The former lost their strong black tints in dying, returning more or less to the normal colour. Dabs, if we might so express it, seem to have little chromatophore capability. One dab which had been injured near the tail showed that though the injured part had been healed it had not yet recovered the normal pigment—the injured region was white on the coloured side and near to it on the white side were a few scattered points of colour. A young dab, two inches long was found amongst the weed brought up in the trawl. Several sea urchins were also picked up. When one of them, measuring about two inches, was placed on its back in a bucket of water it took about four minutes to right itself, but only less than half that time when it was placed near the side of the bucket. Trawling commenced at 8·30 a.m., and was continued for seven hours.

Skate Roads, June 26th.—At 11·20 one haul was made in excellent weather; the sea was smooth and there was a light easterly wind (Table 6).

Goswick Bay, June 28th.—An hour's experiment was made at 6·45 a.m. (Table 6). A second haul, however, resulted in the net being torn on a piece of wreckage, the fish caught being only one sandy ray and one flounder. The temperature of the air was 66 degs. F. and of the water 53 degs. F.

Skate Roads, June 28th.—Beginning at 10·10 a.m., we gave 5½ hours to this bay. The temperature of the surface water was also here 53 degs. F. The hauls gave other than the fish detailed a large number of *Corystes cassivelaunus*.

Cambois Bay, July 3rd.—A strong easterly wind had caused a moderately rough sea. The wind on the day of the experiment was N.N.E changing to N. The temperature of the air was 57 degs. and of the water 55 degs. Starting at 9·35 a.m. we fished for 5½ hours. The first haul yielded only a few small fish. The second haul of 1½ hours was the one measured (Table 6). A large number *Portunus holsatus* got, as we have often noted so commonly in the bays of the along the coast, were berried females. Several specimens of young Loligo were also procured during the day.

Blyth Bay, July 3rd.—At 6·5 p.m. a haul of 50 minutes in this bay gave the small catch measured (Table 6). Berried *Portunus holsatus* were again common, and one specimen of *Corystes cassivelaunus* was procured.

Druridge Bay, July 10th.—The weather was good though there was a slight mist and some thunder with rain in the afternoon. The light wind was N.E. The temperature of the air was 64 degs. and of the water 58 deg. There was again a large number of berried *Portunus holsatus*. A female was opened and the heart was found to be beating 44 times in the minute.

Alnmouth Bay, August 14th.—The fishing showed a great improvement, though done in miserable weather. The wind changed from S.E. to S.W. in the morning but went back again to the east in a short time. Rain fell constantly the whole day. There was a moderate easterly swell which increased during the day.

Cambois Bay, August 28th.—Fishing was commeneed at 10·45 a.m. and was continued for 6½ hours. There was a strong N.W. wind, and the sea was rough. A large number of edible erabs were brought on board, old females and soft and hard young males. A fairly large number of *Cyprina islandica* were also procured, and some were found to contain the parasite, Malacobdella. Numbers of *Portunus holsatus* were caught, many of them being berried females, and also *Eupagurus bernhardus* in *Fusus antiquus* and *Buccinum undatum*. Still more noteworthy, however, were the 4 or 5 haddocks measuring about 5 inches eaught in the trawl.

Druridge Bay, September 4th.—The temperature of the air was 60 and of the water 55, the wind being east and the sea moderate. The trawl was down from 10·10 to 11·20 a.m. (Table 6).

Cambois Bay, September 4th.—A haul was made here from 12·40 to 1·40 (Table 6).

Druridge Bay, September 12th.—Strong easterly winds had produced a heavy swell. The temperatnre of the air was 60 degs. and of the water 55 degs. A few *Cyprina islandica* and edible erabs were procured in addition to the *Portunus holsatus* and the small anglers.

The table shows that plaice reach an average of 130. This is the highest average yet recorded, and a reference to the reports for 1899 and 1900 amply demonstrate that this form is steadily improving in numbers. Dabs, on the other hand, only give an average of 73 as compared with 96 in 1900, 81 in 1899, and 77 in 1898. The figure is above the averages recorded for the years previous to 1898. Turbot, with an average of 6, offer a slight improvement over the average for 1900. Soles present the average this year of 7, as compared with 14 in 1900, 6 in 1899, and 2 in 1898; previous to 1898, as a rule, the averages were much greater. Flounders have an average of 6, and that was the average for the two previous years. The total flat fishes show a diminution this year, the average being 211. This is above the average for the years prior to 1896, but it is below the averages recorded for the years since 1896.

TABLE I.

PLACE.	DATE.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Gurnard.	Skate.	Total.	Mid-day Temp. of Surface.	SEA.	WIND.
Skate Roads, 7 hours ...	June 20th, 1901	18	1	...	121	19	6	22	4	191	50°	Smooth.	S.W., light.
,, 5½ hours ...	,, 28th ...	17	7	...	88	6	26	4	3	151	53°	Do.	E., light.
Cambois Bay, 5½ hours ...	July 3rd ...	2	...	4	32	31	1	...	...	70	55°	Moderate.	N.N.E.
Blyth Bay, 2 hours ...	,, 3rd ...	...	1	2	11	9	...	...	...	23	55½°	Do.	N.
Druridge Bay, 8½ hours...	,, 10th ...	2	...	22	105	51	...	16	...	196	58°	Smooth.	N.E., light.
Alnmouth Bay	,, 24th ...	...	...	2	149	126	...	3	...	280	58°	Do.	Calm.
Druridge Bay	,, 31st ...	2	...	16	94	169	1	34	...	316	59°	Do.	S.E.
Skate Roads	Aug. 6th ...	21	1	...	106	2	...	...	...	130	58°	Do.	a.m. S. by W. p.m., E.N.E.
Alnmouth Bay, 7¾ hours	,, 14th ...	2	...	13	270	111	6	8	...	410	57°	Rough.	variable, rain all day.
Cambois Bay, 6½ hours ...	,, 28th ...	2	...	2	125	77	6	2	...	214	54°	Do.	Strong, N.W.
Druridge Bay, 8½ hours...	Sept. 12th ...	4	1	7	211	139	1	17	1	381	55°	Moderate.	N.E.

RESULTS OF TEN YEARS' EXPERIMENTS.

As this year completes the tenth year of the experimental trawling instituted by Ald. Dent, I propose giving a fuller analysis of the results than has hitherto been attempted. As has been apparent from the reports given from year to year all that was aimed at in the experiments was to present comparative tables showing the catches of the larger fishes or such fishes as might have been sold in the market. A whole day was given to each excursion and this had the advantage of lessening the effects of influences which would tend to cause variation, such, for example, as might be produced by the condition of the tide. When I was introduced to the work in 1896, I thought it well not to interfere with the general aim of the investigations, and I only took the opportunity of making such other observations and collateral experiments as could be carried out under the circumstances.

As far then as the results refer to the catches of marketable fishes they have been made on parallel lines during the whole period of ten years. A small trawl of 22 feet beam was used. The fish retained were sorted every time the net was brought on board, and they were counted at the end of the day's fishing. The experiments were made in available places in-shore. The lines along which the trawling was done varied within small limits depending upon the state of the tide, but the time devoted to the experiment would tend to make the ground fished over pretty much the same on each occasion. The stations were (1) Blyth Bay (2-5 fathoms), (2) Cambois Bay (2-3 fathoms), (3) Druridge Bay (2-3 fathoms), (4) Alnmouth Bay (2-3 fathoms), and (5) Skate Roads ($2\frac{1}{2}$-4 fathoms).

At mid-day the temperature of the surface water was taken and the condition of the sea and the direction of the wind noted. We were anxious to make the hydrographical work more accurate and complete, but we have been hampered for want of funds, and for another reason we decided to wait until the recommendations of the International Conferences in this respect had been published.

As the experiments have been made during the summer from about the third week of June to the early part of September they are not subject to much variation caused by season. But even during this short period it has been observed that the fishing as a rule had improved towards the end of the season.

It will be convenient to present the whole returns in the following manner (Table II):—

TABLE II.—Tables showing the number of fish caught in each Bay.

1. BLYTH BAY.

YEAR.	DATE.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Haddock.	Whiting.	Gurnard.	Skate.	Total Flat Fishes.	Grand Total.	Mid-day Temp. of Surface.	SEA.
1892	Aug. 1	...	...	1	88	40	...	...	...	...	...	129	129	...	Rough
	,, 15	...	1	...	20	12	...	...	...	...	...	33	33	...	Smooth
	Sept. 20	2	...	3	60	41	...	...	...	...	...	106	106	...	Rough
1893	Aug. 2	3	...	56	59	23	...	...	...	...	...	141	141	55	Smooth
	Sept. 13	6	...	17	37	19	...	...	...	...	...	79	79	56	Rough
1894	July 27	2	...	43	67	23	2	5	...	41	1	137	184	52	Smooth
1895	July 31	1	...	12	64	32	...	4	...	25	...	109	138	53·5	,,
	Aug. 15	4	...	20	58	95	...	7	...	10	...	177	224	54	,,
1896	June 18	7	...	5	85	44	...	...	...	46	...	141	187	53	,,
	Aug. 26	2	...	36	63	78	2	...	...	20	1	181	202	55	,,
1897*a*	Aug. 25	2	...	3	55	35	5	...	...	23	...	100	123	58	Rough
1898*b*	*July 13	1	...	11	103	67	1	...	...	7	...	183	199	53	,,
1899*c*	Aug. 30	...	...	...	20	19	...	...	...	2	...	39	41	57½	Mod.
1900*d*	**July 4	1	...	10	193	55	1	...	...	...	...	260	261	54	Rough
1901*e*	,, 7	...	1	2	11	9	...	..	...	...	...	23	23	55½	,,

a. 3½ hours. *b*. 4 hours. *c*. 1 hour. *d*. 6½ hours. *e*. 2 hours.
* Codling 9. ** Lemon Dab 1.

2. CAMBOIS BAY.

1892	Aug. 11	...	..	...	80	44	...	...	...	...	...	124	124	...	Smooth
	Sept. 13	3	...	7	120	80	...	...	...	...	...	210	210	...	,,
	,, 15	2	...	8	81	47	...	...	...	...	...	138	138	...	,,
1893	July 15	2	...	3	50	12	...	...	...	...	...	67	67	54	Rough
	Aug. 7	4	...	16	60	51	...	...	...	...	...	131	131	55	Smooth
1894	Aug. 17	1	...	20	18	11	4	20	...	17	...	54	91	53	Rough
	Sept. 13	1	...	59	30	18	...	22	...	6	...	108	136	53	,,
1895	July 4	3	...	4	37	13	...	...	...	7	...	57	64	52½	,,
	Sept. 5	3	...	4	71	33	...	7	...	85	1	111	204	54	Smooth
1896	Aug. 12	8	...	24	76	81	...	...	...	100	...	189	289	55	,,
1897	July 14	5	...	32	104	73	...	...	...	35	...	214	249	54	,,
	Aug. 25	...	...	15	62	113	...	...	...	23	...	190	213	58	Rough
1898	Aug. 10	2	...	7	56	82	1	..	...	13	...	148	161	55	Mod.
1899	Aug. 16	7	1	19	126	112	...	...	...	21	1	265	287	57	Smooth
a	,, 30	3	...	10	81	44	1	...	...	20	...	139	159	57½	Mod.
1900*b*	July 11	2	1	8	21	59	1	...	...	2	1	92	95	56	,,
1901*c*	July 3	2	...	4	32	31	1	...	...	...	...	70	70	56	,,
d	Aug. 28	2	...	2	125	77	6	...	...	2	...	212	214	54	Rough

a. 5 hours. *b*. 4¼ hours. *c*. 5½ hours. *d*. 6½ hours.

II—CONTINUED.

3. DRURIDGE BAY.

DATE.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Haddock.	Whiting.	Gurnard.	Skate.	Total Flat Fishes.	Grand Total.	Mid-day Temp. of surface.	SEA.	WIND.
Sept. 16	...	...	13	140	70	...	...	...	...	...	223	223	...	Smooth	S.W.
Aug. 31	9	...	24	87	67	...	...	...	...	4	187	191	56	,,	N.E.
Sept. 8	7	...	28	73	39	...	...	...	...	...	147	147	56	,,	N.N.E.
July 4	27	...	5	146	54	3	7	...	...	3	235	245	54	,,	W.
Aug. 22	7	...	36	50	40	2	24	...	120	...	135	279	55	,,	N.E.
June 20	5	...	6	120	15	2	...	...	13	2	148	163	52	Rough	N.E.
July 11	5	...	12	116	60	...	...	...	35	1	188	224	52½	Smooth	W.
Aug. 22	2	...	11	132	70	...	2	...	120	1	215	338	55	,,	Calm
July 9	9	...	35	160	68	...	...	...	83	3	272	358	54	,,	S.W.
,, 29	8	...	8	157	68	1	...	...	143	...	242	385	55	Rough	E.
Sept. 8	13	...	26	104	123	1	...	...	124	1	267	392	56	Smooth	E.
July 28	22	1	37	129	34	3	...	...	75	...	226	301	55½	,,	W.
Sept. 1	19	...	15	102	104	3	...	...	196	4	243	443	55	,,	S.W.
June 30	7	1	3	105	91	1	...	...	16	3	208	227	51½	,,	N.E.
July 20	11	2	6	70	150	3	...	...	43	3	242	288	55	Slight	S.E.
Aug. 31	8	...	3	83	72	2	...	...	12	6	168	186	53½	Rough	N.E.
July 19	1	...	1	24	65	1	...	...	20	...	92	113	57	Smooth	W.
,, 26	2	1	3	101	60	...	...	...	56	...	167	223	56	,,	W.N.W.
Aug. 23	10	1	20	176	157	3	...	...	39	...	367	406	58	,,	Calm
June 20	11	1	7	101	52	...	...	...	11	...	172	183	...	,,	N.W.
Sept. 12	6	1	16	120	114	1	...	...	53	...	258	311	57	,,	N.W.
July 10	2	...	22	105	51	...	...	...	16	...	180	196	58	,,	N.E.
,, 31	2	...	16	94	169	1	...	...	34	...	282	316	59	,,	S.E.
Sept. 12	4	1	7	211	139	1	...	...	17	1	363	381	55	Mod.	N.E.

* 1 Codling.

4. ALNMOUTH BAY.

July 25	9	...	8	116	100	...	..	...	...	4	233	237	54	Smooth	N.W.
Aug. 22	3	...	11	75	49	...	...	...	...	1	138	139	55	,,	S.S.W.
July 11	17	...	5	131	63	14	2	...	49	3	230	284	52	,,	N.E.
,, 31	8	...	18	60	51	4	12	...	17	3	141	173	54	,,	Calm
Aug. 29	14	...	8	65	35	7	15	...	85	2	129	231	55½	,,	W.
July 25	7	...	4	118	82	...	10	...	24	...	211	245	52	,,	N.E.
Aug. 29	3	...	7	101	46	...	103	...	65	1	157	326	54	Mod.	W.
July 23	13	...	30	202	117	3	2	1	29	1	365	398	55	Smooth	W.
Aug. 19	9	1	9	154	44	3	...	...	46	...	220	266	55	,,	N.
July 7	6	...	2	58	62	1	...	...	27	2	129	158	51	,,	N.W.
Aug. 19	8	...	10	253	43	5	...	...	34	...	319	353	56	,,	W.
July 6	11	...	3	117	59	18	...	2	19	1	208	230	52	,,	N.N.W.
,, 27	9	2	...	195	113	5	...	...	11	...	324	335	55	,,	N.W.
July 5	...	1	1	76	76	12	...	...	12	...	166	179	58	Mod.	N.E.
Sept. 6	7	...	8	241	139	9	...	...	61	...	404	465	58	Smooth	E.
June 29	1	1	6	118	81	26	...	1	9	...	233	243	54	,,	S.W.
July 25	4	...	23	96	180	5	...	2	12	...	308	323	57½	,,	W.
Aug. 14	2	...	19	140	131	12	...	...	27	...	304	331	60	,,	Calm
July 24	...	...	2	149	126	...	...	...	3	...	277	280	58	,,	,,
Aug. 14	2	...	13	270	111	6	...	...	8	...	402	410	57	Rough	varied rain

* 1 Codling. ** 1 Lemon Dab.

TABLE II—CONTINUED. 5. SKATE ROADS.

YEAR.	DATE.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Haddock.	Whiting.	Gurnard.	Skate.	Total Flat Fishes.	Grand Total.	Surface Temp.	SEA.
1894	June 27	28	...	1	371	22	19	...	...	...	4	441	445	54	Smooth
	Aug. 6	18	...	1	90	30	9	...	...	81	3	148	232	54	,,
1895	June 26	4	...	...	120	42	...	6	...	30	...	166	202	53	Rough
	Aug. 5	1	...	3	75	13	...	4	...	70	...	92	166	53½	Mod.
1896	June 24	4	...	2	143	9	34	...	...	3	2	192	197	53	Smooth
	Aug. 3	50	1	2	155	10	32	...	...	29	...	250	279	55	Rough
1897	June 23	44	7	5	111	20	21	...	...	6	8	208	222	...	Smooth
	Aug. 11	33	2	6	138	30	10	...	...	17	1	219	237	58	Rough
1898	June 23	23	5	1	95	39	6	...	...	6	3	169	178	50	Smooth
	Aug. 1	7	1	2	154	116	7	...	...	...	...	187	187	55	,,
1899	June 21	1	...	...	104	5	13	...	...	1	...	123	124	54	,,
	Aug. 7	18	...	...	169	39	11	...	...	47	6	237	290	58	Mod.
1901	June 20	18	1	...	121	19	6	...	...	22	4	165	191	50	Smooth
	Aug. 9	21	1	...	106	2	...	...	...	...	...	130	130	58	,,

The returns for Blyth Bay show that with the exception of this year the conditions as regards quantity of fish are little changed at the end of ten years. Turbot and soles have certainly decreased in number, but plaice and more especially dabs have increased. The records for the latter half of the period under consideration, as is apparent, do not come into parallel with those of the first part, and rather than attempt to rectify them by calculation I have preferred leaving this bay out of the following table, which brings together the results in a convenient form (Table III).

In this table, under each heading, the first line gives the total number of fishes caught during the whole period and the second line shows the average catch for each excursion. In a similar manner the results of the first half of the period up to and including 1896 and also for the second half up to and including 1901 are presented. Lastly all these results are gathered together into one statement under the title "Total Results for above 4 Stations."

TABLE III.

CAMBOIS BAY.

Period.	Number of Excursions.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Total.	Temp.
1892-1901	18	50	2	242	1230	981	14	2519	
	Average	**2·8**	**0·1**	**13·5**	**68·3**	**54·5**	**0·8**	**140**	**54·9**
1892-1896	10	27	0	145	623	390	4	1189	
	Average	**2·7**	**0·0**	**14·5**	**62·3**	**39·0**	**0·4**	**118·9**	**53·8**
1897-1901	8	23	2	97	607	591	10	1330	
	Average	**2·9**	**0·2**	**12·1**	**76**	**74**	**1·0**	**166·2**	**55·8**

DRURIDGE BAY.

1892-1901	24	197	10	360	2706	1932	28	5227	
	Average	**8·2**	**0·4**	**15·0**	**112·7**	**80·5**	**1·2**	**217·8**	**55·3**
1892-1896	11	92	1	204	1285	674	9	2259	
	Average	**8·4**	**0·1**	**18·5**	**116·8**	**61·3**	**0·1**	**205·4**	**54 5**
1897-1901	13	105	9	156	1421	1358	19	2968	
	Average	**8·0**	**0·7**	**12·0**	**109·3**	**96·8**	**0·2**	**228·3**	**55·9**

ALNMOUTH BAY.

1893-1901	20	133	5	187	2735	1708	130	4898	
	Average	**6·6**	**0·2**	**9·4**	**136·8**	**85·4**	**6·3**	**244·9**	**55·1**
1893-1896	9	83	1	100	1022	587	31	1824	
	Average	**9·2**	**0·1**	**11·1**	**113·6**	**65·2**	**3·3**	**202·7**	**54·1**
1897-1901	11	50	4	87	1713	1121	99	3074	
	Average	**4·5**	**0·3**	**7·9**	**155·7**	**102**	**9**	**279·4**	**56·1**

SKATE ROADS.

1894-1901	14	270	18	23	1952	296	168	2727	
	Average	**19·3**	**1·3**	**1·6**	**139·4**	**21·1**	**12**	**194·8**	**54·3**
1894-1896	6	105	1	9	954	126	94	1289	
	Average	**17·5**	**0·2**	**1·5**	**159**	**21**	**15·7**	**214·8**	**53·7**
1897-1901	8	165	17	14	998	170	74	1438	
	Average	**20·6**	**2·1**	**1·7**	**124 7**	**21 2**	**9·2**	**179·7**	**54·7**

Total Results for above 4 stations.

1892-1901	76	650	35	812	8623	4917	340	15371	
	Average	**8 6**	**0 5**	**10 7**	**113 5**	**64·7**	**4·5**	**202·3**	**54·9**
1892-1896	36	307	3	458	3884	1777	138	6561	
	Average	**8·5**	**0 1**	**12·7**	**107·9**	**49·4**	**3 8**	**182 3**	**54·1**
1897-1901	40	343	32	354	4739	3140	202	9810	
	Average	**8·6**	**0 8**	**8 8**	**118 5**	**78 5**	**5·1**	**220·2**	**55·7**

It is quite clear that certain changes have taken place. Firstly, the temperature was higher by 1 to 2 degrees during the second half of the period. Secondly, as regards the catches of marketable fish, the results may be stated in words as follows:—

Cambois Bay.—Turbot have remained steady; soles have decreased; plaice have increased; dabs have almost been doubled in numbers, bringing the proportion of dabs from about half to about equal to plaice. Flounders and brill may be said to have increased, but brill are only rarely obtained, only 2 being caught in 18 excursions. The total number of flat fishes has made a distinct and satisfactory increase.

Druridge Bay.—The average catches in this bay are larger for all classes than at Cambois Bay. Comparing the two periods of five years each we note that turbot have also remained steady here; plaice have decreased; dabs have greatly increased, again approaching the plaice in numbers; brill and flounders may be said to have improved. The total flat fishes present an increase, though not to the same degree as at Cambois Bay.

Alnmouth Bay.—The average catches more nearly approximate in point of view of numbers to the last bay. Both turbot and sole present a decrease, while all the other forms have improved in numbers, the dabs as before to the most conspicuous degree, giving to the total flat fishes a decided increase.

Skate Roads.—This bay, as will be seen in the next table, is peculiarly different from the other places experimented in. There are only three years in the first period. The forms which have improved in numbers are turbot (slightly), brill (more distinctly). Soles and dabs have remained practically steady, while plaice and flounders have decreased. With this it has to be stated that the total numbers of flat fishes in this bay have decreased during the period investigated—since 1894.

The TOTAL RESULTS for all these four stations show that as a whole for the district turbot have remained steady; brill seem to be improving in numbers—it will be seen that out of the 35 brill caught at the 76 excursions 32 were obtained during the last five years; soles are getting less numerous every year practically speaking; plaice have slightly improved, and dabs have greatly improved in numbers; flounders also presented a slight increase. The total catches of flat fishes show that an increase—of about 20 per cent.—has taken place during the second period of five years.

This is a most gratifying conclusion to this period of experiment, and it has all the more value that the results are the outcome of a most simple determination where the chance of error is so small as to be altogether unimportant when spread over such a large series of experiments. The tables given represent simply the total catches of fishes which could if necessary have been sent to market, the smaller fishes being immediately returned to the sea. We can say with confidence that the in-shore waters or at any rate the parts of them inhabited by the flat fishes in about 2-5 fathoms have improved during the last ten years. From the statements made by Mr. Dent and others who have had excellent opportunities for judging of the changes as well as those made by the fishermen themselves we might be justified in saying that the bays are recovering slowly from the effects of the immense amount of in-shore trawling to which they were exposed just prior to the beginning of our experiments.

These changes have necessarily produced changes in the relative proportions of the fishes, and an attempt has been made to express them in the following table:—

TABLE IV.

Proportional Catches of Flat Fishes,
the total number of flat fishes caught being taken as 1,000.

	Period.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Total.
Blyth Bay	1892-1901	17	1	119	535	322	6	1000
	1892-1896	22	1	156	487	330	4	,,
	1897-1901	7	1	43	631	306	12	,,
Cambois Bay	1892-1901	19	1	96	488	390	6	,,
	1892-1896	23	0	122	524	328	3	,,
	1897-1901	17	2	73	456	444	8	,,
Druridge Bay	1892-1901	38	2	69	517	369	5	,,
	1892-1896	41	0·5	90	568	298	3	,,
	1897-1901	35	3	53	479	424	6	,,
Alnmouth Bay	1893-1901	27	1	38	558	349	27	,,
	1893-1896	46	0·5	55	560	322	17	,,
	1897-1901	16	1	28	558	365	32	,,
Skate Roads	1894-1901	98	7	9	715	109	62	,,
	1894-1896	81	1	7	740	91	73	,,
	1897-1901	115	12	10	694	118	51	,,

The figures require no explanation, but they lead to the reflection that while an improvement has taken place, it is not altogether a recovery to the conditions of the past. Turbot and soles we are told used to be very much more plentiful. The former have not improved in numbers and the latter have distinctly decreased. It is more than probable, moreover, that the proportion as regards dabs is quite a modern feature.

The table shows also the proportional catch which would be made by a trawler in the in-shore waters.

Another change has been drawn attention to in previous reports, viz., that, while in some cases, and especially during the first period, a decrease in the total catch was evidenced towards the end of the summer, in general, the fishes tend to improve both in numbers and size—say during August and the beginning of September. As a rule, too, in rough weather the results are worse than when the sea is smooth and the conditions otherwise favourable. It is a rule, not without exception, as will be seen by a glance over Table II. But at the same time the general better conditions during the last five years as compared with the first may have had some influence in producing the results indicated.

FISHERY STATISTICS.

These results accruing from the experimental trawling in our in-shore waters would have been better stated, and indeed the experiments would not have been necessary, if the Board of Trade had been able to furnish more complete and more accurate fishery statistics. Even when obtained under the best conditions the figures are only approximately correct, and in many cases they appear to be altogether untrustworthy.

The line fishermen agree among themselves at any rate in saying that their industry is getting worse and worse year after year. The reports of the fishery officers, who from their position have excellent opportunities for judging, render the statements of the fishermen every support. From the reports we gather that the white fishing of the district for the last six years was as follows, not including North Shields:—

1895.	1896.	1897.	1898.	1899.	1900.
Tons Cwts.	Tons Cwts.	Tons Cwts.	Tons Cwts.	Tons Cwts.	Tons Cwts.
2,671 4	2,321 7	1,359 6	1,061 13	1,091 9*	601 19

* Including Salmon caught in the Southern District.

This regrettable and startlingly steady decrease has been correlated with an increase in the crab and lobster fishing, and with a diminution in the number of boats and men employed in white fishing due to other causes—the main one, however, being that the fishermen find employment during the winter at quarries, mines, buildings and shipyards. The reason they give is that the crab fishing during the latter end of the year is so poor as regards quality of the catch and the line fishing so unproductive that they can obtain a better livelihood at such work as above stated.

All this goes to show that if the in-shore waters offer an improvement in flat fishes, and principally in dabs since steam trawling was prohibited, that haddocks, whitings, codlings and the like are not nearly so plentiful, neither at the times when nor the places where they used to be caught. It is to be regretted that we can only infer this, and that the information is lacking which would enable us to make the statement authoritatively.

At North Shields, on the other hand, it is clear from the following table (Table V.), which I owe to the Quaymaster, Mr. T. McKenzie, that there has been a steady increase in the landings of white fish. How far this has been due to an increase in the number of steam trawlers and liners and improvement in their efficiency I have not been able to discover. But, as I pointed out last year, Mr. Garstang, Naturalist at the Plymouth Laboratory, stated, as a result of his analysis, that trawling steamers are not catching the quantity which they ought to catch if the conditions of the sea as regards fish were remaining steady. We must naturally make allowance for the fact that an increase in the number of trawlers would tend to decrease the catch of each.

TABLE V.

The weight and value of White Fish and Herrings, and the numbers of Crabs landed at North Shields, each year since 1889.

YEAR.	Approximate Weight of White Fish. Tons.	Approximate Value of White Fish. £	Approximate Weight of Herrings. Tons.	Approximate Value of Herrings. £	Approximate Number of Crabs.
1889	4,484	61,883	7,558	51,217	12,800
1890	5,763	79,408	6,523	53,155	12,320
1891	6,458	94,501	4,988	54,410	31,420
1892	7,612	112,320	9,356	37,642	23,280
1893	8,548	132,519	8,436	51,697	14,080
1894	8,688	130,837	5,845	35,589	9,800
1895	9,196	135,183	5,041	36,499	33,920
1896	7,511	119,952	5,479	32,127	53,780
1897	8,193	135,550	3,902	37,820	83,510
1898	9,072	138,710	3,245	20,826	116,780
1899	10,462	160,515	2,574	24,265	84,080
*1900	11,360	185,935			

* From Fishery Officer's Report.

DETAILED ANALYSIS OF THE FIRST HAUL.

In the following table (Table VI.), the complete records with the sizes of the fish caught at the first haul are presented. It will be seen that compared with previous years the results are very uneven, and in a number of instances are very disappointing.

TABLE VI.

SKATE ROADS, June 10th (1 hour 15 minutes.)

INCHES.

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total.
Plaice ...	2	20	29	29	14	9	4	2	1	2	...	...	...	..	...	...	112
Dab ...	...	2	1	3	2	1	1	1	...	...	...	...	...	...	..	...	11
Turbot ...	...	...	..	...	.	...	2	...	1	...	...	..	...	...	...	..	3
Gurnard ...	...	..	..	..	...	...	1	1	1	...	...	...	...	..	..	...	3
Skate ...	...	..	...	..	...	...	..	...	...	...	...	...	1	...	...	1	2
																	131

SKATE ROADS, June 26th (1 hour 10 minutes.)

Plaice ...	7	33	41	33	16	12	10	11	5	3	1	2	...	..	...	..	174
Dab ...	...	1	8	1	1	...	...	...	2	...	..	..	1	..	...	...	14
Turbot ..	..	...	...	...	..	2	...	1	...	1	...	1	...	...	1	...	6
Brill ...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1
Flounder...	...	...	...	2	...	2	1	...	...	...	2	...	1	1	..	...	9
Gurnard ...	...	...	1	3	1	2	...	...	1	...	...	...	...	...	...	...	8
Angler ...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	2
																	214

SKATE ROADS, June 28th (1 hour 20 minutes.)

Plaice ...	7	40	46	43	27	15	9	1	10	3	2	...	..	...	...	...	203
Dab ...	...	1	2	1	3	...	...	..	.	1	...	...	...	...	...	...	8
Turbot ...	...	...	...	...	...	...	..	1	1	1	...	...	...	...	...	...	3
Brill ...	..	.	...	...	...	...	...	1	...	...	...	...	...	...	...	..	1
Flounder...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	..	.	2
Gurnard ...	...	...	...	1	...	1	...	...	...	...	...	...	...	..	...	..	2
Angler ...	...	..	...	...	...	...	...	...	1	...	...	...	.	...	...	...	1
																	220

GOSWICK BAY, June 28th (1 hour)

Plaice ...	7	83	16	15	6	...	1	1	3	1	1	...	...	...	...	...	134
Dab ...	...	...	1	...	1	...	1	...	...	...	...	.	...	..	...	...	3
Turbot ...	...	...	...	...	...	..	...	2	...	2	...	...	...	...	...	...	4
Brill ...	...	...	...	..	...	...	...	1	...	...	...	...	...	...	...	...	1
Flounder...	..	...	...	6	3	4	3	2	..	...	...	1	...	..	1	...	20
Gurnard ..	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	2
Angler ...	...	...	...	1	1	...	...	..	..	...	...	...	...	...	...	...	2
Lumpsucker	..	...	...	...	1	...	...	..	...	...	...	...	...	..	..	...	1
Cottus bubalis...	...	1	...	...	..	...	...	...	.	...	...	..	...	...	..	...	1
																	168

TABLE VI.—CONTINUED.

CAMBOIS BAY, July 3rd (1½ hours.)

INCHES.

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total.
Plaice ...	1	4	13	14	5	2	2	...	2	...	...	...	...	...	...	..	43
Dab ...	1	6	13	6	3	4	...	2	...	...	...	...	...	...	...	...	35
Turbot ..	...	...	...	...	...	...	...	..	...	...	...	1	..	...	...	...	1
Sole ...	...	...	...	...	...	1	...	...	..	...	...	.	...	...	...	...	1
Flounder ..	..	1	1	1	1	2	...	...	..	...	...	..	...	...	..	...	6
Whiting ...	...	...	1	...	...	...	...	...	...	...	...	..	...	..	...	...	1
Gurnard ...	21	11	3	3	...	...	...	...	...	..	...	...	...	...	...	...	38
Angler ..	...	...	...	...	...	..	1	...	...	..	..	...	...	...	...	...	1
Weever ...	...	1	...	...	...	..	...	...	...	...	...	...	...		..	...	1
Dragonet	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
																	128

BLYTH BAY, July 3rd (50 minutes.)

Plaice ...	2	4	2	1	1		1	1	..	...	...	...	...	..	..	..	12
Dab ...	...	4	2	3	2	1	4	1	..	..	...	...	..	..	..	...	17
Brill ...	...	...	...	.	...	...	...	...	...	..	...	1	...	..	..	...	1
Sole ...	..	...	...	1	...	...	..	...	1	...	..	...	..	...	...	...	2
Flounder ..	...	..	...	1	1	2	..	...	...	...	...	..	..	..	...	...	4
Gurnard ...	...	..	2	2	...	...	..	...	...	...	..	...	...	..	...	...	4
Cottus quadricornis	...	1	...	..	...	...	...	..	...	...	..	...	..	...	...	..	1
																	41

DRURIDGE BAY, July 10th (1 hour 25 minutes.)

Plaice ...	...	1	5	4	2	4	3	2	1	4	3	1	...	...	1	...	31
Dab ..	...	2	...	3	3	3	2	1	1	1	..	...	...	...		...	16
Sole ..	...		...	...	...	...	3	..	...	...	1	..	...	...	..	...	4
Flounder...	...	..	...	1	..	...	...	...	..	..	...	..	..	...	..	..	1
Gurnard ...	..	..	1	2	...	1	2	...	1	...	...	...	...	..	...		7
																	59

ALNMOUTH BAY, July 24th (1 hour.)

Plaice ...	...	...	4	2	3	2	5	5	2	...		...	...	..	...	...	23
Dab ..	1	1	7	3	14	3	1	..	...	...	...	...	...	..	...	...	30
Sole ..	...	...	...	...	...	.	..	...	..	1	...	...	...	...	...	..	1
Flounder...	...	...	1	...	1	1	...	..	..	...	...	...	...	...	...	...	3
Gurnard ...	...	..	1	...	..	...		...		...	...	..			...	...	1
																	58

DRURIDGE BAY, July 31st (65 minutes.)

Plaice ...	...	1	5	5	3	2	5	1	3	3	1	...	1	1	...	...	31
Dab ...	...	1	1	35	30	16	3	...	..	...	1	...	...	...	...	.	87
Sole ...	...	...	.	...	...	...	2	...	...	...	..	...	...	...	...	...	2
Gurnard ...	...	...	..	...	1	2	...	2	...	...	...	...	...		...	...	5
Angler ...	...	...	..	...	.	...	1	...	..	...	...	...	...	.	...	...	1
																	126

TABLE VI.—CONTINUED.

SKATE ROADS, August 6th (1¼ hours.)

INCHES.

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total.
Plaice	...	46	13	2	4	...	4	7	12	1	...	...	...	...	..	...	89
Dab	...	3	...	1	...	...		...	...	...	...	...	...	..	...	...	4
Turbot	...	...	...	...	...	1	1	2	2	...	...	...	...	..	...	...	6
Brill	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1
Flounder	...	...	...	...	...	...	...	..	...	1	...	...	...	...	...	...	1
Gurnard	...	...	...	1	..	...		..	...	.	...	..	...	..	...	...	1
Angler	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1
																	103

ALNMOUTH BAY, August 14th (1 hour)

Plaice	...	7	40	15	10	19	18	6	8	7	1	...	...	1	...	...	132
Dab	2	1	2	6	14	9	4	2	1	...	1	...	...	...	...	...	42
Lemon Dab	...	...	...	1	...	...	...	...	...	...	...		...	..	..	..	1
Sole	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	..	1
Flounder	..	...	4	13	19	4	2	...	...	...		...	...	..	...	...	42
Gurnard	1	1	...	...	..	...	...	...	...	...	...	...	.	.	...	...	2
																	220

CAMBOIS BAY, August 28th (1 hour.)

Plaice	..	2	16	10	13	11	7	8	3	1	...	...	...	..	...	...	71
Dab	...	1	2	16	8	5	4	...	...	1	1	...	...	...	...	..	38
Whiting	...	...	2	1	...	...	...	...	...	...	...	...	...	...	...	..	3
Flounder	...	...	...	..	...	1	...	..	...	...	...	...	...	..	...	..	1
Sole	..	...	..	1	...	...	...	...	...	..	...	...	...	...	...	..	1
																	114

DRURIDGE BAY, September 4th (1 hour.

Plaice	...	...	11	8	.	1	1	2	2	...	1	...	...	...	..	..	26
Dab	...	..	2	1	5	3	2	1	1	...	...	..	...	...	...	...	15
Sole	...	...	...	...	...	...	..	...	1	...	...	...	...	..	...	...	1
Flounder	...	..	...	...	1	...	...	..	..	.	...	...	...	...	...	...	1
Gurnard	...	...	..	...	1	...	2	...	1	1	1	...	...	..	...	..	6
																	49

CAMBOIS BAY, September 4th (1 hour.)

Plaice	...	3	2	4	1	1	1	...	...	...	...	...	..	..	...	12
Dab	1	...	...	2	3	1	..	1	...	...	...	...	...	...	...	8
Gurnard	...	...	...	...	..	...	1	...	...	...	...	..	..	...	...	1
																21

DRURIDGE BAY, September 12th (1¼ hours)

Plaice	...	2	11	15	8	16	35	19	10	...	...	...	...	...	...	...	116
Dab	...	3	1	2	4	10	9	6	3	1	...	..	..	...	...	...	39
Sole	...	...	...	...	1	...	...	...	1	...	...	...	...	1	..	...	3
Flounder	...	...	...	...	...	1		...	...	...	...	...	...	...	...	...	1
Gurnard	...	...	..	...	2	1	3	...	1	...	1	..	...	...	...	...	8
Angler	...	...	...	...		...	3	1	...	...	...	..	...	...	...	...	1
																	171

The results for the three years may be thus summarized.

PLAICE.

	Inches.														
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1899	...	—...	1·9...	8·6...	7·8...	7·1...	4·4 ..	4·7...	4·7...	3·6 .	3·5...	2·6...	1·4...	0·1...	0·1...	—...
1900	...	1·2 ..	6·9...	10·4 ..	11·7...	12.2 .	8.3...	4·2...	4.2...	2·8...	2·5...	1·6...	1·5...	0·7...	0·2	—...
1901	...	1·7...	16·2...	17·0...	13·2 ..	7·7...	6·3 .	7·1...	4·5 ..	4·1 .	1·7 ..	0·7...	0·2...	0·1...	0·1 .	0·1...

These figures represent the average catch of each size per haul, and they show that while the very small and immature plaice have increased that the larger sizes have decreased.

For dabs the corresponding figures are :—

	4	5	6	7	8	9	10	11	12	13	14	15	16
1899	.. 0·1...	1·0...	2·9...	16·6...	14·9 ..	6·5	3·5 .	1·2...	0·2...	0·7...	0·2...	0·1...	—
1900	...2·2 .	6·9...	4·3...	6·3...	6·1...	6·0...	4·2...	2·0...	0·5 ..	0.2 .	0·2...	0·1...	0·2
1901	...0·3...	1·8	2·8...	5·4...	6·1...	3·9...	2·1 .	0·9...	0·6...	0.3...	0·2...	—...	0·1

In the latter case the numbers show rather a diminution in the catch in the younger stages as compared with the older. It would be premature, however, to attempt to draw any conclusion from these tables.

THE FOOD, SEX, AND DEGREE OF MATURITY OF THE FISHES.

The observations made on the food and the condition with regard to maturity in relation to size of the fishes examined are presented in the following table (Table VII).

Plaice.—While as before the food on the whole is molluscan, annelids and amphipods are in request as well, and in the stomach of one of the larger forms a weever was found.

It now seems clear from our observations that plaice may become mature when they reach a length of 16 inches, but in some cases the condition is not attained until they measure over 17 inches. See also report for 1899.

Dab.—*Portunus holsatus*, the livid swimming crab, is what we usually expect the dabs to be feeding upon, but a molluscan and even an amphipod diet was found this year not unfrequently. In one example the stomach contained a sand eel.

As before we have failed to discover the usual signs of maturity in dabs even up to $12\frac{1}{2}$ inches in length. In one case, however, opaque ova were observed in a dab measuring $11\frac{3}{4}$ inches, but another female at the same time of the same size was found to be immature or to all appearances immature.

An Angler dissected on August 14 was found to have been feeding upon whitings.

TABLE VII.—PLAICE.

Date.	Size.	Sex.	Mature or Immature.	Size of Gen. Organ.	Food.	Remarks.
				Ins.		
June 20th ... (Skate Roads)	$12\frac{3}{4} \times 7\frac{3}{4}$	F.	—	—	Empty, small pieces of shell of urchin	.....
	12 × 7	M.	—	—	Empty	.....
	$9\frac{1}{2} \times 5\frac{1}{2}$	F.	—	—	,, ...	.....
June 28th ... (Skate Roads)	16 × $9\frac{1}{2}$	F.	—	$1\frac{3}{4}$	*Tellina tenuis*	.....
	12 × $7\frac{1}{4}$	F.	—	—	,, ...	.....
July 3rd (Cambois)	16 × $9\frac{1}{4}$	F.	+	2	*Tellina tenuis*	Ova visible
	$14\frac{1}{2} \times 8\frac{1}{2}$	F.	—	$1\frac{3}{8}$	Empty	.....
	12 × $7\frac{1}{4}$	F.	—	$1\frac{1}{4}$?	,, ...	.....
July 10th ...	$13\frac{1}{2} \times 8$	M.	—	$\frac{5}{8}$	*Tellina tenuis*	.....
	16 × $9\frac{3}{4}$	M.	—	$\frac{5}{8}$	,, ...	.....
	12 × $7\frac{1}{4}$	F.	—	$1\frac{1}{8}$	Annelid...	.....
July 31st ...	16 × 9	F.	—	1	*Donax trunculus*	No ova visible
	$16\frac{1}{4} \times 9$	F.	+	$1\frac{1}{2}$	Fish, much digested	A few ova visible
	11 × $6\frac{1}{2}$	M.	—	$\frac{1}{4}$	Empty	No milt
	23 × $13\frac{1}{2}$	F.	+	—	Weever	Ova distinct
	$21\frac{1}{2} \times 12\frac{1}{4}$	F.	+	—	Empty	,,
Aug. 14th ...	16 × $9\frac{1}{2}$	F.	—	$1\frac{1}{2}$	*Tellina tenuis*	Ova—but none opaque
	$16\frac{1}{2} \times 10$	F.	+	$1\frac{3}{8}$	,, ...	Opaque ova numerous
	10 × $5\frac{1}{2}$	F.	—	$\frac{7}{8}$	Annelid, Mollusean remains and caudal end of *Ampelisca lævigata*	.....
Aug. 28th ...	15 × $8\frac{1}{2}$	F.	—	2	*Donax trunculus*, *Tellina tenuis*	One or two opaque ova
	14 × $8\frac{1}{2}$	F.	—	$1\frac{1}{4}$	Empty	.....
	10 × $5\frac{3}{4}$	M.	—	$\frac{1}{4}$	Nereis, digested Mollusean foot, *Ampelisca lævigata* *Bathyporeia pelagica*, Paratylus	.....
Sept. 4th ...	12 × 7	M.	—	$\frac{3}{8}$	Solen ?	.....
	$12\frac{1}{2} \times 7\frac{1}{2}$	M.	—	$\frac{1}{2}$	Empty	.....
	9 × 5	F.	—	$\frac{1}{8}$	,, ...	.....
Sept. 12th ..	13 × $7\frac{1}{2}$	M.	—	$\frac{1}{2}$	Empty	.....
	$12\frac{1}{2} \times 7\frac{1}{2}$	M.	—	$\frac{1}{2}$	Annelid	.....
	11 × $6\frac{3}{4}$	F.	—	$1\frac{1}{4}$	Empty	.....

TABLE VII. CONTINUED.—DAB.

..te.	Size.	Sex.	Mature or Immature.	Size of Gen. Organ.	Food.	Remarks.
				Ins.		
)th ... Roads)	$15\frac{1}{2} \times 9$	F.	+	—	*Portunus holsatus*	.....
8th ... Roads)	13 × 7	F.	+	—	Solen foot?	.....
	15 × $8\frac{1}{2}$	F.	+	$3\frac{1}{2}$	Empty	.....
:d ... ıbois)	11 × 6	F.	+	$1\frac{7}{8}$	*Ophiura albida*	.....
	$12\frac{1}{2} \times 6\frac{1}{2}$	F.	—	$1\frac{1}{2}$	Empty	.....
	10 × 5	F.	—	$1\frac{1}{2}$	*Portunus holsatus* and *Ophiura albida*	.....
)th ... dge B.)	$14\frac{1}{4} \times 7\frac{1}{2}$	F.	+	3	Solen foot and foot of other large Mollusc	.....
	$12\frac{1}{4} \times 6\frac{3}{4}$	F.	+	$1\frac{3}{4}$	Empty	.....
	11 × 6	F.	—	$\frac{7}{8}$	*Portunus holsatus*	.....
1st ...	12 × $6\frac{1}{2}$	F.	—	$1\frac{1}{2}$	*Portunus holsatus*	No ova visible
	$12\frac{3}{4} \times 7\frac{1}{4}$	F.	—	$1\frac{1}{2}$	,, ...	,,
	$9\frac{1}{4} \times 4\frac{3}{4}$	M.	—	$\frac{3}{4}$	Empty	No milt
4th ...	$11\frac{3}{4} \times 6$	F.	—	$1\frac{5}{8}$	*Portunus holsatus*	No ova visible
	$11\frac{3}{4} \times 6$	F.	+	2	Empty	One or two ova visible
	$9\frac{1}{2} \times 5$	F.	—	$\frac{7}{8}$	Small Anomia shells *Paratylus swammerdami*	.....
28th ...	$13\frac{1}{2} \times 7$	F.	+	2	Foot of *Cyprina islandica*—possibly from dissected specimens thrown overboard	Few ova visible
	13 × $6\frac{3}{4}$	F.	+	2	Sand-eel	.....
	$9\frac{1}{4} \times 5$	F.	—	$\frac{3}{4}$	*Portunus holsatus*	... ..
4th ...	$12\frac{1}{2} \times 7$	F.	—	$2\frac{1}{8}$	*Portunus holsatus*	No ova visible
	$9\frac{2}{4} \times 5$	F.		1	Empty	,,
	$10\frac{1}{4} \times 5\frac{1}{4}$	F.	+	$1\frac{3}{8}$	Solen	Few ova
12th ...	16 × 9	F.	+	$3\frac{1}{2}$	*Portunus holsatus*	
	$12\frac{1}{2} \times 7$	F.	—	$1\frac{3}{4}$	Solen	No ova to be seen ·
	10 × $5\frac{1}{2}$	F.	—	$1\frac{1}{2}$	*Portunus holsatus*	,,

TABLE VII. CONTINUED—TURBOT.

Date.	Size.	Sex.	Mature or Immature.	Size of Gen. Organ.	Food.	Remarks.
				Ins.		
June 20th	$14\frac{1}{2} \times 11$	M.	+	—	Annelid, much digested ...	... ..
(Skate Roads)	$13\frac{1}{4} \times 10$	F.	—	—	Empty	.....
	$12 \times 9\frac{1}{2}$	F.	—	—	,, ...	.....
June 28th ...	$15\frac{1}{2} \times 12$	M.	+	$1\frac{3}{8}$	Empty	.....
(Skate Roads)	13×10	F.	+	$2\text{-}2\frac{1}{2}$	,, ...	.....
July 3rd ...	14×11	F.	—	$2\frac{1}{4}$	Sand-eels	.. ...
(Cambois)	13×10	M.	+	$1\frac{1}{2}$	,, ...	.....
July 10th ...	$18\frac{1}{2} \times 14$	F.	+	3	Empty	.....
(Druridge B.)						
July 31st ..	$14\frac{3}{4} \times 10\frac{1}{4}$	M.	—	1	*Portunus holsatus*	No milt
Aug. 14th ...	16×12	M.	+	$1\frac{1}{4}$	Empty	.....
	$14 \times 10\frac{1}{4}$	M.	—	1	4-in. Whitings	No milt
Sept. 12th ...	$10 \times 7\frac{1}{2}$	M.	—	$\frac{1}{2}$	Sand-eel	.....
	$13 \times 11\frac{1}{2}$	M.	+?	1	,, ...	.....
	$13\frac{1}{2} \times 10$	M.	+?	$\frac{7}{8}$	Empty	.....

BRILL.

June 20th ...	$9\frac{3}{4} \times 6\frac{1}{2}$	M.	?	—	Empty	.....
(Skate Roads)						
June 28th ...	$11\frac{1}{5} \times 8$	M.	+	$\frac{3}{4}$	Sand-eel	.....
(Skate Roads)	$10\frac{1}{2} \times 7$	F.	—	$1\frac{1}{4}$	Shrimps	.....

SKATE.

June 20th	16	M.	+		*Portunus holsatus*	.....
	19	M.	+		,, ...	.....
	—	M.	+		,, ...	... ..
	—	M.	+		,, and shrimp ...	... ..

TABLE VII. CONTINUED—SOLE.

Date.	Size.	Sex.	Mature or Immature.	Size of Gen. Organ.	Food.	Remarks.
				Ins.		
3rd ...	$13\frac{1}{4} \times 5$	F.	—	3	Empty	.....
nbois)	$9\frac{1}{2} \times 4$	M.	—	$\frac{1}{4}$	,, ...	.....
10th ...	$15 \times 6\frac{1}{2}$	F.	+	$3\frac{1}{2}$	Annelids (Nereis)	Ova well developed, ovary of greater diameter than that of next specimen
	$13\frac{1}{2} \times 5\frac{3}{4}$	F.	+	$5\frac{1}{2}$	Empty	Ova well developed
31st ...	$18\frac{1}{2} \times 8$	F.	+	7	Sand-eels and Annelid ...	Ripe
	19×8	F.	+	7	Empty	,,
	$10\frac{1}{4} \times 4$	F.	—	$1\frac{3}{4}$	Annelid	No ova visible
14th ...	$17\frac{1}{2} \times 7\frac{1}{2}$	F.	+	7	Empty	Few ova visible
	$18\frac{1}{2} \times 8$	F.	+	7	Sand-eels.	Ova visible
	11×4	F.	—	$2\frac{1}{2}$	Empty	Immature
4th ...	11×4	F.	—	$1\frac{1}{2}$	Empty	,,
	$11\frac{3}{4} \times 4\frac{1}{2}$	F.	—	$2\frac{3}{4}$	,, ...	,,
	$16\frac{1}{2} \times 7$	F.	+	6	,, ...	Mature
	$16\frac{1}{2} \times 7$	F.	+	6	Annelids	,,
	12×5	M.	+?	$\frac{3}{8}$	Empty	

FLOUNDER.

28th ...	$15\frac{3}{4} \times 8\frac{1}{2}$	F.	+	?	*Tellina tenuis*	.....
e Roads)	$14 \times 7\frac{1}{2}$	F.	+	3	,, ...	.....
4th ...	$8\frac{1}{2} \times 4\frac{1}{2}$	M.	—	4	Empty	.....

GURNARD.

28th ...	$11\frac{1}{2}$	F.	—	$1\frac{3}{4}$	*Tellina tenuis*	.....
10th ...	12	F.	+	$1\frac{3}{8}$	Sand-eel, *Portunus holsatus*, *Idotea tricuspidata* ...	.....
31st ...	$13\frac{1}{2}$	F.	+	$1\frac{1}{2}$	*Portunus holsatus*	.....
	$11\frac{1}{4}$	F.	+	$1\frac{1}{2}$	,, ...	.....
	10	F.	+	$1\frac{1}{4}$	Sand-eel (small)	.....
28th ...	14	F.	—	$2\frac{1}{4}$	Empty	.....
	11	F.	—	$1\frac{1}{4}$	,, ...	.....
4th ...	$13\frac{1}{4}$	F.	+	2	,, ...	.....
	$11\frac{3}{4}$	F.	+	2	,, ...	.....
	$11\frac{1}{2}$	F.	+	$1\frac{1}{2}$	*Crangon vulgaris*	.....
12th ...	15	F.	+	$1\frac{3}{4}$	Empty	.....

BIOLOGICAL INVESTIGATIONS.

The following table exhibits the general character of the organisms caught by surface and ground nets at the excursions. In the case of Plankton the approximate quantity of the material, after being allowed to settle, is given and the time during which the net was down. Unless otherwise stated, the steamer was trawling at the time the net was being used, and the speed would therefore be about 2 knots. The net used on all these occasions was made of bunting and the diameter of the hoop would be about one foot.

It will be seen that from 1 to 9 c.c. are obtained in about one hour, occasionally bulking when Medusoids are present. The Crustacean life practically always obtained in Plankton determinations includes Copepoda and Cladocera, the former being conspicuously prominent. We have had to record instances, however, of the Cladocera being predominant. Occasionally, also, in-shore a quantity of dinoflagellate protozoa are met with, and these appear to quite predominate in mid North Sea. If we take it that 5 c.c. is the usual catch and 5,000 cubic feet the quantity of water which passes through the net, this would give 1 c.c. to every 1,000 cubic feet near the surface. That this figure is much too small, however, is evidenced by the fact that a short gentle row with a similar net at Cullercoats will give 1-3 c.c. in some 300 feet. The column of water in the net prevents the ingress of much fresh material unless the speed be slow enough to equalize the passage of the water through the material of which the net is made.

It is fairly constant in quantity—at all events it is so in our ordinary in-shore experiments. On every occasion we obtain much the same volume of material. In June, 1899, however, the quantity was very much above the average.

To the above Crustacean and Protozoan life higher Crustacea are added occasionally even at the surface, as *Hippolyte varians*, Mysids, Amphipods, especially Hyperoche and Euthemisto, and Isopods. Of the latter it is noteworthy that in 1896-7 *Eurydice achatus* was very commonly obtained at the surface, but since then it has only rarely been observed. It was often taken in company with *Idotea tricuspidata*, *Gammarus locusta* and lumpsucker embryos. In the early part of the summer we procure certain fish ova and larval fish and during the year a succession of larval forms representing nearly all the groups of invertebrate life. Fairly constantly present, likewise, are Sagitta and Pleurobrachia. Beroe is sometimes very common, and the ordinary jelly fishes occupy naturally a conspicuous place in our Plankton.

TABLE VIII.

BIOLOGICAL INVESTIGATIONS.

(The asterisks are meant to indicate the relative abundance of the organisms and groups mentioned.)

tc.	Place.	Surf. Temp.	Apparatus.	Depth.	Quantity.	Organisms.
19 ...	Bass Rock, inner side on rough, sandy bottom	?	Bottom net on ground	11 fathoms	(20 minutes.)	Stones and sand with Pleurobrachia, Phiallidium variabile Tubularia indivisa Asterias rubens jv. Annelid Polyzoa Chiton Cardium Astarte compressa Ascidia Stenothoe
19 ...	Bass Rock, inner side on rough, sandy bottom	?	Surface net simply hanging in current	11 fathoms	5 c.c. in 20 mins.	Actinula Pleurobrachia ** Phiallidium variabile ** Sagitta ** Copepoda **** Cladocera Amphipods : Metopa alderi Stenothoe marina
20 ...	Skate Roads	50°	Bottom net on beam	2-3 fathoms	9 c.c. in 1½ hours	Flounder ova 2 Sarsia tubulosa Copepoda **** Cladocera * Veligers
20 ...	Skate Roads	50°	Surface net	2-3 fathoms	22 c.c. in about 1 hour	Ova : Weever 5 Five-brded. Rockling 10 Pleurobrachia ** Phiallidium variabile Sagitta * Copepoda **** Cladocera ** Balanus larvæ * Eupagurus jv ** Veligers
28 ...	Skate Roads	53° air 56°	Surface net	2-3 fathoms	9 c.c. in 1½ hours	Ova : Weever *** Dab ** Turbot 1 Five-brded. Rockling *** Sarsia tubulosa *** Phiallidium variabile *** Cladocera *** Copepoda ** Balanus larvæ ** Zoea 1 Pseudocuma cercaria 1 Pluteus larvæ * Eurydice pulchra 1 Amphipods :— Hyperoche tauriformis Parathemisto oblivia

TABLE VIII.—CONTINUED.

Date.	Place.	Surf. Temp.	Apparatus.	Depth.	Quantity.	Organisms.
June 27 ...	Staple Sound	?	Surface net (small)	8-10 fathoms	1·5 c.c. in 5-10 minutes	OVA : Five-bearded Rockling Dab * Copepoda *** Cladocera ** Zoea. Nauplii Young lamellibranchs
June 26 ...	Inner Farne	52° air 59°	Bottom net	9 fathoms bottom fine sand		Small Aurelia & Cyanea Monoculodes carinatus Calanus sp.
June 26 ...	Holy Island Harbour, 11-12 p.m.		Ground net	1 fathom		Gasterosteus spinachia (1 inch) Hippolyte varians ** Macromysis inermis ,, flexuosa ** Cuma Ampelisca lævigata
July 3 ...	Blyth Bay	55·5°	Surface net	2-5 fathoms	9 c.c. in 40 mins.	OVA : Weever ** Five-bearded Rockling ** Flounder ** Post-larval sand-eel Larval Rockling? Cladocera *** Copepoda *** Megalopa * Hyperoche tauriformis
July 3 ...	Blyth Bay	55·5°	Bottom small net	2-5 fathoms	1 c.c. in 1 hour	OVA : Brill 1 Cladocera *** Copepoda ** Veligers **** Young lamellibranchs
July 10 ...	Druridge Bay	58°	Surface net	3 fathoms	9 c.c. in 1¼ hours	Good deal of weed floating about surface. OVA : Weever ** Five-bearded Rockling ** Gurnard *** Cladocera *** Copepoda ** Nauplii * Barnacle embryos Veligers **** Small lamellibranchs ** Dinoflagellates *

TABLE VIII.—CONTINUED.

ce.	Place.	Surf. Temp.	Apparatus.	Depth.	Quantity.	Organisms.
0 ...	Druridge Bay	58°	Small bottom net	3 fathoms	5 c.c. in 1½ hours	OVA: Brill 1 Larval sand-eels 3 Nauplii * Cladocera ** Copepoda ** Megalopa * Zoea * Balanus larvæ
1 ...	Druridge Bay	59°	Surface net	2-3 fathoms	3 c.c. in ¾ hour	OVA: Weever ** Dab ** Copepoda *** Cladocera * Nauplii. Zoeæ Megalopoda Plutei * Young Echinoderms Veligers and young pelecypods
(Large quantity of Jelly-fish floating about—mainly Pelagica.)						
1 ...	Druridge Bay	59°	Bottom net (Steamer drifting)	3 fathoms		AMPHIPODS: Paratylus uncinatus Siphonoecetes colletti Gammarus marinus Bathyporeia pelagica Synchelidium brevicarpum Pseudocuma cercaria
4 ...	Alnmouth B.	57°	Surface net	2-3 fathoms	4 c.c. in ¾ hour	Sand from rough sea Veligers **** Young bivalves * Nauplii. Zoea ** Megalopa Barnacle larvæ Copepoda ** Cladocera **
28 ..	Cambois B.	54°	Surface net	2-3 fathoms	5 c.c. in 1¼ hours	Larval herring * Copepoda *** Cladocera * Sagitta ** Veligers ** Young starfishes * Pseudocuma cercaria *

TABLE VIII.—CONTINUED.

Date.	Place.	Surf. Temp.	Apparatus.	Depth.	Quantity.	Organisms.
Aug. 28 ...	Cambois B.	54°	Bottom net on beam	2-3 fathoms	6 c.c. in $1\frac{1}{4}$ hours	Young herring Copepoda *** Veligers **** Sagitta ** Pseudocuma cercaria Paratylus Macromysis inermis Annelid (in tube)
Sept. 4 ...	Blyth Bay	55°	Surface net	2-5 fathoms	1 c.c. in 1 hour	Suspended matter * Copepoda ** Cladocera * Megalopa ** Nauplii. * Zoeæ * Bathyporeia pelagica
Sept. 4 ...	Blyth Bay	55°	Bottom net	2-5 fathoms	3 c.c. in 1 hour	Debris: Coal dust & Copepoda * Paratylus Bathyporeia Synchelidium Schistomysis jv.
Sept. 12 .	Druridge Bay	55°	Surface net	2-3 fathoms	1 c.c. in 1 hour at 6-7 p.m.	Hippolyte varians 1 Pseudocuma cercaria Immature amphipod Cast coats of Balanu Balanus larvæ Zoeæ. Megalopa Veligers. Caligus Cladocera *
Sept. 22 ...	Druridge Bay	55°	Bottom net on ground (Steamer drifting)	3 fathoms		Galathea Crangon fasciatus Schistomysis spiritus Pseudocuma cercaria Diastylis spinosa * Iphinoë trispinosa Paratylus falcatus ** Siphonoecetes collett Dexamine spinosa Bathyporeia pelagica Pleurobrachia * One with 5 spin

THE CHANCE OF RECOVERY OF FISH CAPTURED IN THE TRAWL AND RETURNED TO THE SEA.

Observations have been made from year to year at our trawling excursions on this subject, and the results have already been referred to in previous reports. In 1896 I said "that the young flat fish swam away at once evidently none the worse for being dragged along with the trawl—often for over two hours—their visit to the deck of the steamer and being swept overboard." The experimental work since that year has led to no different conclusion. We can say with confidence that practically all the flat fishes and about half at least of the gurnards recover. Even as regards the gurnards we may add that such an expression rather understates the results. Doubtful cases—including gurnards as well as flat fishes—have been frequently placed in buckets of water, and in the majority of instances recovered completely.

The factors which must be considered as militating against the chance of recovery are—extremely warm dry weather, the keeping of the fishes longer than necessary on deck, the length of time during which the trawl has been down, and the quantity of fish captured. The conditions favourable to recovery are—cold and damp weather, as little handling as possible, short hauls and, it ought to be added, a poor catch. With fishes which find it difficult to leave the surface —the fishes with a swimming bladder—a heavy toll is exacted by the crowd of piscivorous birds which follow a steamer when a catch is being dealt with.

In commercial trawling there are several circumstances which tend against the chance of recovery, viz. (1) the long time during which the trawl is in operation—usually four hours at a comparatively high rate of speed, (2) the heavy quantity of fish packed together in the cod-end, (3) the large proportion of fish caught with distended air bladders. It must be conceded, however, that the catch is promptly dealt with and the rejected part of it immediately returned to the sea. And also that in these days as a rule there is little to throw overboard, unless the catches prove to be of exceptional

excellence. Trawlers, moreover, do not remain long on a ground where the fish caught include a heavy percentage which has to be rejected. But in spite of all that it must be said that the chance of recovery of the fish returned to the water in commercial trawling is a small one.

For this reason, if our fisheries are deteriorating by over-fishing, a prohibition which prevents the trawler from fishing in places where he will have many fish to throw overboard is a right one. Such is the case with regard to in-shore fishing, and all the more so because the rejected part of the catch would consist for the most part of the young of the important food fishes. That such a prohibition is beneficial is evidenced by the results of our in-shore trawling experiments.

TRAWLERS AND THE ARTIFICIAL FERTILIZATION OF FISH OVA.

Resulting from our experiments on the artificial fertilization of fish ova, we have some progress to record. A conference was held at North Shields with the owners, captains and other members of the crews of trawling steamers under the chairmanship of the late regretted Alderman J. F. Spence. At this meeting a committee was formed to endeavour to arrange that certain of the captains and others should attend at the Cullercoats laboratory to receive instruction upon the subject. It was decided in the first instance to ask these men to perform the work according to instructions at sea, and to bring a sample to the laboratory and to watch the progress of the ova at successive visits. We thus proposed to accomplish the very desirable work of persuading these men to return the ova after fertilization to the sea without taking them away from their duties.

The results in the way of attendance, however, do not encourage the idea of pursuing this plan in the future. Only three of the captains attended once, while one attended on four occasions. We were told that this was because the men had very little time ashore. These men, however, saw certain stages in the development of plaice ova, and the opportunity was taken to give some information in an informal manner as to the life-histories of the more important fishes. The little embryos forming in the ova, exhibited with the aid of the microscope, served to convince those who did attend that the work required of them was amply justified. And that the work was done in a satisfactory manner was shown by the fact that among the large quantity of ova sent me, especially by Captain Cappelman, not one was found to be unfertilized.

A pamphlet on the subject, with directions, was also circulated amongst those whom we wished to interest.

We began late but we have pleasure in stating that Captain Cappelman dealt with over 40 cod and 12 plaice. At a modest estimate we may say that the 40 cod yielded say 120,000,000 ova and the 12 plaice 2,000,000 ova. Captain Cappelman said that a number of the other captains had also been carrying out this work.

In round numbers then we are in a position to say that our efforts this season have resulted in the return of some 500,000,000 fertilized ova to the North Sea. The number is too small to have very much effect, but it is encouraging and warrants us making further efforts next season.

In this connexion we have been led to the conclusion that our work of investigation into the local fisheries would be much facilitated were we to establish a branch laboratory at North Shields on or near the Fish Quay. The salt water available would do for keeping the specimens alive, and Cullercoats is not very far away should it be found desirable to send living material to the tanks there.

It would be possible even with care to hatch out fish at North Shields, and such would therefore be at hand for demonstration to the fishermen and others.

But the laboratory would have even more justification from its position at the most important fishing station on the coast, offering the means for attacking with a wealth of material, problems relating to the food, distribution, migrations, growth, and periods of maturity of the common fishes, as well as other questions of economic and biological interest.

We feel convinced that the results would in a very short time justify the innovation.

THE MUSSEL EXPERIMENT ON THE COQUET.

The mussels put down for experimental purposes on the Coquet were of two kinds, viz., young mussels from Blyth and small mussels from the rocks at the outside of Amble Harbour. The latter made no progress and indeed soon disappeared. On the south side of the river the Blyth mussels did well for a few weeks but they gradually disappeared likewise. They were put down rather high up and were to some extent liable to be covered with mud. On the north side, however, and especially where they were placed near to low water they grew well and rapidly, so much so that we found they were gathered with the native mussels by a number of men who frequent very constantly the Coquet for that purpose.

It is difficult forecasting from the progress made by a few mussels put down in rather a scattered manner, how far a mussel bed would be a commercial success. What we have to guide us is that mussels grow there at present if not numerously, at least to a good bait size, and they are "well-filled." Our experiment shows also that the conditions are very favourable for the growth of mussels. The unfavourable circumstances are—(1) the mud which comes down the river during a fresh and (2) the dredging of the harbour which would interfere with the lodgement of spat. There is, however, a great deal of room in parts of the harbour not touched by the dredging operations and about the piers, and we have confidence in recommending, therefore, that a start should be made by getting together in the most favourable places the mussels already in the river and adding a few tons from another place.

After the statement, which was made at the October meeting of the Sea Fisheries' Committee, that the Budle beds could not cope with the local demands, it is desirable that the Conservancies and Harbour Commissioners as well as the owners of Fenham Flats should be approached with a view to developing the mussel resources of the rivers over which they have jurisdiction. A beginning could be made in a small way, such as that suggested for the Coquet. It would demand very little expenditure in the way of labour or otherwise. If this is done such bodies may find, as has been the experience at St. Andrews and Montrose, that mussel beds may be made a valuable source of revenue.

It is gratifying to note that local fishermen have this year obtained good supplies of mussels from the piers in Blyth Harbour. It may be suggested that the Commissioners of the harbour should make an attempt to so regulate the mussel supply as to develope it and make it permanent.

At Mr. Dent's request a quantity of American oysters was placed in the Coquet near Warkworth. Unfortunatly, the only place available, so that they could be kept under observation, was rather high up the bank, and they were under only a few inches of water. The first night of frost killed the great majority, but the survivors when placed in deeper water remained alive and got into excellent condition. An oyster pond, which would provide for a good depth of water, say three to five feet, and which could be partially emptied when wanted, would therefore do very well for storing oysters. We cannot say whether spat would be likely to lodge or not.

CRABS AND LOBSTERS.

We have again the pleasure of submitting tables showing the catches of crabs and lobsters, contributed by Mr. J. Douglas, Beadnell, and Mr. G. Fawcus, Sea Houses.

Mr. Douglas wrote, when he sent his tables, "The first three months' catches were counted by the bulk or by the number of barrels day by day, so that they are correct. The other three months' catches were counted when they were taken out of the boat."

TABLES SHOWING THE CATCHES OF CRABS AND LOBSTERS FOR 1901.

TABLE I.—BY MR. J. DOUGLAS, BEADNELL.

CRABS—1901.

	January.	February.	March.	April.	May.	June.
f Pots	100	100	100	248	248	248
tes.	Numbers.	Numbers.	Numbers.	Numbers.	Numbers.	Numbers.
...	...	...	...	500	33	138
...	200	360	...	30	76	...
..	300	...	...	...	40	120
...	320	300	...	64	10	100
...	500	...	500		...	68
...	...	...	200	78	168	40
...	...	500	200	...	40	68
...	...	200	...	120	120	70
...		300	300	100	163	...
...	500	...	..	80	170	108
...	500	...	500	66	246	...
...	360	...	100	100	...	120
...		500	400	..	250	58
..	400	400	200	...	60	...
...	...	300	200	187	16	126
...	...	...	160	121	168	
...	500	...	...	130	...	127
...	100	500	400	120	120	120
...	...	200	200	87	...	226
...	...	200	...	51	370	112
...	500	...	...	...	78	181
...	...	300	200	160	128	68
..	700	...	400	28	135	...
...	600	...	...	73	100	100
...	...	...	...	60	128	68
..	300	300	...	...	...	77
...	...	400	...	80	320	50
.	400	200	200	...	128	...
..	...	...	200	260	136	...
...	...	...	...	140	138	...
...	...	...	...	...	120	...
	Days. Numbers.	Days. Numbers.	Days. Numbers.	Days. Numbers.	Days. Numbers.	Days. Numbers.
s ...	15 6,180	15 4,960	16 4,360	22 2,635	26 3,461	21 2,145
ge per ..	412	311	272·5	120	133	102

TABLE I.—Continued.

LOBSTERS—1901.

	April.	May.	June.
Number of Pots	240	240	240
Dates.	Numbers.	Numbers.	Numbers.
1st	1	3	14
2nd	6	17	...
3rd	...	7	9
4th	8	8	15
5th	...		7
6th	5	17	6
7th	...	10	5
8th	6	12	10
9th	3	6	...
10th	1	4	9
11th	6	2	8
12th	9	...	4
13th	...	22	2
14th	...	25	...
15th	1	13	7
16th	6	4	..
17th	4	..	...
18th	3	6	6
19th	4	...	7
20th	9	4	11
21st	..	8	18
22nd	10	12	6
23rd	16	14	...
24th	10	20	14
25th	10	12	8
26th	...		...
27th	12	2	4
28th	...	7	...
29th	10	9	...
30th	11	14	...
31st	...	9	...
	Days. Numbers.	Days. Numbers.	Days. Numbers.
Totals	22 151	26 267	20 170
Average per day	7	10	8·5
Number of Berried Hens ...	10	33	44
Number of Small returned ...	36	48	30

Mr. Fawcus pointed out, in reference to the poor catches of lobsters, that he had not been fishing in shallow water for lobsters, but had been putting his pots into situations more favourable to the catching of crabs.

TABLE II.—By Mr. G. FAWCUS, Sea Houses.

CRABS—1901.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Berried Hens.	Number of Hard.	Number of Soft.	Depth in Fathoms.
Feb. 20	52	25	35	60	...	60	...	18
21	52	30	40	70	..	70	...	,,
26	52	65	55	120	...	120	...	,,
27	52	20	25	45	...	45	...	,,
28	52	10	20	32	...	30	2	,,
5 days	...	150	175	327	...	325	...	...
Average	per day	30	35	65		65	..	...
Mar. 7	80	132	142	278	...	274	4	18
9	80	100	140	240	...	240	...	,,
11	100	180	130	312	...	310	2	,,
12	100	40	20	60	...	60	...	,,
14	100	45	55	104	...	100	4	,,
15	100	24	14	38	...	38	...	,,
18	100	50	40	90	...	90	...	,,
22	100	140	100	244	...	240	4	,,
23	90	30	20	53	...	50	3	,,
28	14	6	10	16	...	16	...	,,
29	100	80	100	180	...	180	...	,,
11 days	...	827	771	1615	...	1598	17	...
Average	per day	75	70	147	...	145	2	...
April 1	154	70	80	150	...	150	...	18
4	154	61	70	132	1	132	...	,,
5	154	80	80	160	...	160	...	,,
6	154	60	80	140	...	140	...	,,
7	154	50	40	90	...	90	..	,,
9	154	50	70	120	...	120	...	,,
12	72	6	4	10	...	10	...	,,
13	154	80	70	150	...	150	...	,,
15	154	84	76	161	1	161	...	8 to 18
16	154	72	48	120	...	120	...	,,
17	104	50	40	91	1	91	...	,,
18	154	16	14	31	...	30	1	,,
19	104	19	17	37	...	36	1	18
20	154	40	20	61	...	60	1	8 to 18
22	154	50	40	90	...	90	...	,,
24	154	64	42	106	...	106	...	,,
25	154	52	38	90	...	90	...	,,
26	154	40	25	65	...	65	...	,,
27	154	76	72	149	1	149	..	,,
29	154	70	50	120	...	120	...	,,
30	154	50	40	90	...	90	...	,,
21 days	...	1140	1016	2163	4	2160	3	...
Average	per day	54	48	103	0·2	103	...	...

CRABS.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Berried Hens.	Number of Hard.	Number of Soft.	Depth in Fathoms
May 1	154	50	65	115	...	115	...	8 to 18
2	154	25	20	45	...	45	...	,,
3	68	16	14	30	...	30	...	,,
6	154	40	31	72	1	72	...	,,
7	154	60	50	110	...	110	...	,,
8	154	45	30	76	1	76	...	,,
10	154	80	100	180	...	180	...	,,
11	154	100	100	200	...	200	...	,,
13	152	65	83	149	...	148	1	,,
14	152	60	80	141	1	141	...	,,
15	152	72	95	167	...	167	...	,,
16	152	70	90	160	...	160	...	,,
17	152	90	105	195	...	195	...	,,
18	152	130	106	236	...	236	...	,,
20	152	214	302	520	3	519	1	,,
21	152	114	186	301	1	301	...	,,
22	152	100	125	225	...	225	...	,,
23	125	50	75	126	1	126	...	,,
24	112	70	80	150	...	150	...	,,
25	112	53	75	128	...	128	...	,,
28	112	100	180	280	...	280	...	,,
29	112	50	100	151	1	151	...	,,
30	112	60	70	130	...	130	...	,,
31	112	70	100	170	...	170	...	,,
24 days	...	1784	2262	4057	9	4055	2	...
Average	per day	74	94	169	0·4	169	0·1	...
June 3	112	70	60	132	2	132	...	8 to 18
4	112	51	54	105	...	105	...	,,
5	112	102	94	197	1	197	...	,,
6	112	64	73	137	...	137	...	,,
7	112	53	67	121	1	121	...	,,
8	112	51	53	104	...	104	...	,,
11	112	62	71	135	2	135	...	,,
12	112	85	94	179	...	179	...	,,
15	112	80	73	154	1	154	...	,,
17	112	60	70	130	...	130	...	,,
18	112	74	82	157	1	157	...	,,
19	112	71	80	151	...	151	...	,,
20	112	82	94	176	...	176	...	,,
21	112	47	52	100	1	100	...	,,
22	112	42	54	96	...	96	...	,,
25	112	55	67	123	1	123	...	,,
26	112	50	49	99	...	99	...	,,
27	112	100	94	196	2	196	...	,,
28	112	62	74	137	...	136	1	,,
29	112	54	44	99	...	98	1	,,
20 days	...	1315	1399	2748	12	2726	2	...
Average	per day	66	70	136	0·6	136	0·1	...

LOBSTERS—1901.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Berried Hens.	Depth in Fathoms.
Feb. 20	52	1	...	1	...	8 to 18
26	52	1	...	1	..	,,
27	52	...	1	1	...	,,
3 days ..	...	2	1	3	...	...
March 8	80	1	..	1	...	8 to 18
9	100	1	...	1	...	,,
11	100	1	...	1	...	,,
13	100	...	1	1	...	,,
15	100	...	1	1	...	,,
22	100	1	...	1	...	,,
23	96	1	...	1	...	,,
29	100	1	...	1	...	,,
8 days ...	...	6	2	8	...	...
April 1	154	1	...	1	...	8 to 18
4	154	2	...	3	1	,,
5	154	1	...	1	...	,,
6	154	1	...	1	...	,,
9	154	2	1	3	...	,,
11	154	5	2	8	1	,,
13	154	1	1	2	...	,,
15	154	4	3	7	...	,,
16	154	3	2	6	1	,,
17	104	2	3	5	..	,,
18	154	3	1	5	1	,,
19	104	1	1	2	...	18
20	154	1	1	3	1	8 to 18
22	154	2	1	3	...	,,
24	154	1	3	5	1	,,
25	154	...	2	3	1	,,
26	154	1	1	2	...	,,
27	154	2	1	3	...	,,
29	154	2	...	3	1	,,
30	154	1	2	3	...	,,
20 days...	...	36	25	69	8	...

LOBSTERS.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Berried Hens.	Depth in Fathoms.
May 1	154	1	1	2	...	8 to 18
2	154	2	...	2	...	,,
3	68	3	2	5	...	,,
6	154	1	2	3	...	,,
7	154	2	3	6	1	,,
8	154	1	...	1	...	,,
10	154	2	2	5	1	,,
11	154	2	3	6	1	,,
13	152	2	1	3	...	,,
14	152	1	1	3	1	,,
15	152	...	1	1	...	,,
16	152	2	2	4	...	,,
17	152	5	4	10	1	,,
18	152	2	1	3	...	,,
20	152	3	...	3	...	,,
21	152	...	2	2	...	,,
22	152	...	1	2	1	,,
24	112	1	1	2	...	,,
25	112	1	...	1	...	,,
28	112	1	...	1	...	,,
29	112	2	...	2	...	,,
21 days ..	...	34	27	67	6	...
June 4	112	1	2	3	...	8 to 18
7	112	2	...	2	...	,,
12	112	1	2	3	...	,,
17	112	1	1	2	...	,,
4 days ...	...	5	5	10	...	...

The tables in both cases are interesting additions to the facts we already possess, and are the more welcome that they illustrate the nature of the catches during the first months of the year.

Crabs.—Mr. Douglas began his crab fishing in January, and despite the increased number of pots used in the later months the catch decreased steadily. This agrees with the figures published last year. Mr. Fawcus began about the end of February. His catches were more constant, averaging usually for the whole period a little over one crab per pot per day.

The figures contributed by Mr. Fawcus show that 25 berried hen crabs were caught and returned during the season, the number increasing during the season. The proportion of berried hens to the total catch was 1 : 406. A very few soft crabs were also caught

during the crabbing season, viz., 24 to every 9,000 hard crabs. The males were slightly less in number than the females in February, May and June, but were in excess in April.

Lobsters.—The number of berried hens caught and returned was, at Beadnell, 87 to 588 lobsters—the total catch retained—a ratio of 1 to every 7 which could be brought ashore; at Sea Houses there were 14 berried hens caught along with 146 lobsters, a ratio of 1 to 10. As pointed out last year, there is therefore some degree of hardship in returning the berried hen lobster, but we are assured by the fishermen who do so that the bye-law is conferring a benefit.

The lobster which, as said in last year's report, hatched its berries in the beginning of July, 1900, remained alive and well at Cullercoats until the night of 11-12 September, 1901. On the morning of the 12th she was found dead. She measured: Cephalo-thorax, 5 inches; abdomen, 6½ inches; altogether, 11½ inches. On being opened the pericardial cavity was found to be filled with a gelatinous like mass of clotted blood, which distended the heart as well. The ovary was dark green and the ova were well developed. The liver was white. There was not the least sign of preparation for casting. Recollecting that this lobster was in berry up to July, 1900, and that therefore she could not have cast her shell since June, 1899, when she came into berry, and, indeed, for the latter reason, that she had cast her shell not later than the summer of 1898, we have a period of at least three and perhaps four years which would have elapsed before the next casting, and this in the case of a lobster only measuring 11½ inches. It must mean that some varieties of lobsters reach about their limit of growth very early—*vide* last year's report.

It was a singular coincidence that during the same night a lobster which had hatched out her berries completely by the 28th June cast her shell. The female, which is still alive, was hard again by October 10th, and distinctly so a few days later, thus giving a period of four weeks for the hardening process. The cast shell measured. Cephalo-thorax 5¼ inches, abdomen 6½ inches, altogether 11¾ inches.*

These lobsters were in separate tanks, but we do not see any explanation which could make clear what is at all events a noteworthy coincidence.

A Law of Growth.—The long period elapsing in the later stages between the moultings is very interesting when considered in relation

* This lobster was found dead on January 8th, 1902, owing to the water being neglected. She measured: Cephalo-thorax, 5½ inches; abdomen, 7 inches; total length, 12½ inches.

to a law of growth briefly presented in a recent paper on the "Growth of the Farm Ungulates"*—that the rate of growth gradually lessens in intensity from or near the beginning of development. In other words if we take any three stages at equal intervals in the development or growth of an individual it will be found that the progress made between the first two stages is greater than that made between the second and third. The conditions are apparently met in such animals as the crab and lobster by a gradual extension of the time between the moults. This must all the more clearly be the case since the few details already available in the case of such a measurement as the width of the carapace of the crab show that the increment is much the same each time, viz., about 2/7th.

* The Veterinarian, 1900-1.

CONFERENCES WITH FISHERMEN.

A conference was held at Alnmouth on Thursday, 31st October, Mr. Robertson presiding.

Fishing has greatly declined at Alnmouth, there are now only ten men engaged in the industry, three cobles being in use. At one time, in the memory of the majority of those present, the herring fishing gave employment to the crews of 16 or 18 boats, Boulmer being used to a large extent for landing the catches. At that time, too, 8 or 9 cobles prosecuted the line and crab fishing. The three boats at present occupied in line fishing do very much worse than before. They cannot obtain the large catches of good haddocks, nor in fact so large a weight of fish even of poorer quality. The salmon fishing is improving, the change in the Coquet in this respect also affecting the catches in Alnmouth Bay.

The meeting was strongly of the opinion that a very good mussel bed could be formed in the Coquet, and that the Harbour Commissioners should be approached to give the protection desired and to regulate and develope the Coquet for such a purpose.

The meeting at Newbiggin on 15th November was well attended under the chairmanship of Mr. Tate. A very useful conference on the condition of the fisheries was held. As usual the men complained that the line-fishing was gradually getting worse and worse. The grounds which were at one time available at about 40 fathoms are not now worth visiting, and trawlers deplete them whenever fish are to be found there. The fishing is done nowadays in 25-30 fathoms, and only produces little more than half a basket per man, who has to pay 2s. for his bait. Fifteen cobles are at present prosecuting the line and crab fishing. During the summer 11 or 12 herring boats, employing about 80 men, tend to preserve the fishing population, but during the winter the majority of the men work at the neighbouring coal-pits.

The crab fishing is said to be still keeping pretty good, but the lobster fishing is undoubtedly worse.

Newbiggin, as regards trout and salmon fishing, occupies a unique position, for on the north side of Newbiggin Point the boats can fish for a fortnight longer than on the south side.

Bait, as a rule, is procured from Stockton, but a good supply is only obtained at intervals of four years. Limpets are now much more numerous. The men recommended that Blyth should be made a mussel centre for supplying the southern fishing stations with bait. Were this done it would be a great boon to Newbiggin.

On 20th November a meeting was held at Cullercoats.

The men pointed out here also that a decline in the fishing had taken place, as is shown by the small number of boats now employed, and the fact that the younger men are going into other industries and that even the older men spend the winter as labourers at shipyards and buildings. The fishing ground is now in about 20-22 fathoms, and the catch per boat is about equal to what was the catch per man some 20 years ago, and of much more inferior quality. A good haddock fishing was formerly prosecuted from September to Christmas by 44 boats. At the present time five boats are fishing, but the catches improve after Christmas—at a time, that is to say, when previously the haddocks deserted the fishing grounds. Reference was made, however, to the exceptional catches made in the year 1891. One boat, for example, landed 225 stones. There was also good fishing during the following year, but since that time it has been very bad.

A number of recommendations were made at this meeting which deserve the careful consideration of the Committee.

(1) That a license should be granted to the fishermen to use a small beam trawl of 16 feet, to be worked from the coble, say from 1st September for six weeks.

(2) That a fortnight's extension of the salmon season should be given.

(3) That mackerel fishing with nets would be worth doing at the end of the summer, as a fair number come to the coast at that season.

(4) That as the white-nosed dolphin or "dunter" is the cause of a great deal of damage to salmon that a payment—as is made by France—of eight shillings a head should be offered as an inducement for reducing their numbers. A premium is paid by Denmark for the killing of seals, and it is proposed to offer a premium likewise for the killing of cormorants, such as used to be paid for killing cormorants on the Tyne.

(5) That Blyth Harbour should be developed as a means of supplying the fishermen with bait.

(6) That hatcheries should be established for lobsters so that the fishermen could retain the lobster he catches in return for the ova which would be delivered to the hatchery.

In this latter connexion the men stated that, as a close time is already given naturally by the men with regard to crab and lobster fishing, no bye-law to that effect is required.

The meeting at Cresswell on 29th November furnished information of a similar character to that derived at the other centres.

There is at the present time no line fishing unless such as is necessary for bait for the crab pots. This was the season—from September to Christmas—which gave very good catches of haddocks, &c., some twenty years ago. Now about three basketfuls per boat (about 15 stones) is the catch, and this only includes about 5 stones of haddocks.

It was anticipated that the recent storms would have increased the catches of haddocks, but this has not resulted.

The fishermen recommend that license should be granted to fish with small trawls, as specified above, after the salmon fishing which comes to an end at Creswell on 14th September.

Five boats are fishing for crabs, but the quality is bad (November), and the expensive gear is liable to destruction by storms. The numbers, however, appear to be quite as good as formerly. With regard to lobsters, on the other hand, there is no doubt that they have much deteriorated, and for that reason the men expressed sympathy with the aims of the bye-law referring to the berried hen lobster. During the crab season proper, about 120 pots are in use by each boat, and the average catch is 10 to 12 barrels a day.

The fishermen complained that they were much hampered by the restrictions which prevented them fishing for salmon at the north end of their ground. They were of opinion that the license should give them liberty to fish wherever a drift net could be used.

As a constant supply of bait would be helpful, they joined in the recommendations already made for the improvement of the Blyth and Coquet as centres for supplying the southern villages with mussels.

These conferences show, as we pointed out in the report for 1899, that the condition of things in the fishing villages is far from what we should desire. The herring fishing, the salmon fishing, and the crab and lobster fishing still furnish the main sources of income to the fishermen. It is the line fishing which is threatening to change

the aspect of the fishing villages. There is no reason to doubt that it is getting worse year by year. Fewer men are prosecuting this branch of the fishing industry. They prefer to engage in such work as labourers in connexion with buildings, shipyards, quarries, and, where it is possible, in coal pits. This in preference to entering upon the precarious means of existance offered by line or crab fishing, especially during the last three months of the year. It is not altogether due to a diminution in the numbers of the fishes, although it must be conceded that the haddock fishing is much impaired in situations that the cobles can reach, but to the fact that a more constant and a better income can be obtained by working on shore. The catches are certainly not so good as could be obtained some 20 or 30 years ago, and the fishing is liable to interruptions by storms and fogs.

The southern district, for the obvious reason of its nearness to the commercial centres, is more exposed to these changes than the northern, and in the latter, therefore, we have what many of the fishermen and the merchants consider even a worse modern feature —the heavy and destructive fishing for crabs at a time when the quality is so poor. Still, as the fishermen say, what can they do. The line fishing is not worth going into, and bait is dear and difficult to procure. The arguments which appeal to the fisherman who is about to desert the fishing for some months to become a labourer do not lose any force when given as a reason for preferring the crab fishing.

It is sufficient, perhaps, that we should thus simply present the problem; but it is one which deserves careful consideration. A constructive solution may arise through a discussion of the recommendations given above.

THE

MARINE MOLLUSCA OF NORTHUMBERLAND.

(In continuation of the list contributed by G. P. Bulman.)

By MARIE V. LEBOUR.

We are glad to be able this year to make some interesting additions to our local molluscan fauna ; in fact, in one or two cases, to record shells which are not even in Alder's classical list, and others which are decidedly rare. Several of the shells mentioned below, recorded in a previous list, were then only represented by dead or immature specimens, but have now been found living and abundant on our coasts.

PELECYPODA.

Family—Anomiidæ.
Genus—Anomia.

A. ephippium, (L.) and *v. aculeata* (Müller).

Small specimens very common on the under side of stones at low water, Cullercoats. Worn specimens dredged at a depth of about 17 fathoms, also one live specimen of the variety dredged at a depth of about 39 fathoms.

Family—Mytilidæ.
Genus—Mytilus.

M. barbatus (L.)

One young specimen taken four miles off Cullercoats in 40 fathoms. (On the authority of Mr. G. P. Bulman.)

Family—Arcidæ.
Genus—Leda.

L. minuta (Müller).

A few detached valves from 50 fathoms, off Northumberland.

Family—Kelliidæ.
Genus—Montacuta.

M. ferruginosa (Mont).

Several worn specimens dredged at a depth of about 17 fathoms off Cullercoats.

M. substriata (Mont).

Several from spines of Echinocardium pennatifidum in 39 fathoms off Northumberland.

Family—Carditidæ.
Genus—Cyamium.

C. minutum (Fab).

Very common at the roots of Corallines, in shallow pools, in the rocks at low water, Cullercoats.

Family—Cardiidæ.
Genus—Cardium.

C. fasciatum (Mont).

A few small detached valves dredged at a depth of about 17 fathoms off Cullercoats.

Family—Cyprinidæ.
Genus—Astarte.

A. sulcata (Da Costa).

Very common in 39 to 59 fathoms.

A. compressa (Mont.), *v. striata* (Leach.)

Several young specimens dredged at a depth of about 17 fathoms.

Family—Veneridæ.
Genus—Venus.

V. ovata (Penn).

A few detached valves of very young specimens dredged at a depth of about 17 fathoms off Cullercoats.

Family—Mactridæ.
Genus—Scrobicularia.

S. alba (Wood).

Several detached valves dredged at a depth of about 17 fathoms off Cullercoats.

Family—Saxicavidæ.
Genus—Saxicava.

S. rugosa (L.), *v. arctica.*

A few perfect specimens dredged at a depth of about 17 fathoms off Cullercoats.

GASTEROPODA.

Family—Patellidæ.

Genus—Tectura.

T. virginea (Müller).

Very common in rock pools at low water, Cullercoats.

Family—Capulidæ.

Genus—Capulus.

C. Hungaricus (L.)

Fine large specimens often thrown on the beach, Bamboro'.

Family—Trochidæ.

Genus—Trochus.

T. helicinus (Fab). Margarita helicina of Alder.

One specimen from shell sand, Newbiggin-by-the-Sea.

Family—Rissoidæ.

Genus—Rissca.

R. striata v. arctica (Adams).

Alive under stones at low water, Cullercoats, common. One or two worn specimens dredged at a depth of about 17 fathoms off Cullercoats.

R. reticulata (Mont).

One worn specimen dredged at a depth of about 17 fathoms off Cullercoats.

R. semistriata (Mont).

One worn specimen dredged at a depth of about 17 fathoms off Cullercoats.

R. soluta (Philippi).

Two small fresh specimens dredged at a depth of about 39 fathoms, some 16-17 miles off Souter Point, August, 1901. This, I think, has not before been recorded for this coast. It certainly is not in Alder's list.

Family—Scalariidæ.

Genus—Scalaria.

S. Trevelyana (Leach).

One fine specimen, with a hermit crab inside it, dredged off Blyth.

Family—Pyramidillidæ.

Genus—Odostomia.

O. scillæ (Scacchi).

One specimen dredged at a depth of about 17 fathoms off Cullercoats. This species is not in Alder's list.

O. acicula (Philippi). Chemnitzia acicula of Alder.

Several fine fresh specimens dredged at a depth of about 17 fathoms off Cullercoats. Alder considered this species very rare and only mentions three specimens dredged off this coast.

O. rufa (Philippi), *v. fulvocincta.*

One fine live specimen from 39 fathoms, 16 or 17 miles off Souter Point. This species is not in Alder's list.

O. unidentata (F. and H).

One specimen dredged at a depth of about 17 fathoms off Cullercoats.

O. interstincta (Mont).

One specimen dredged at a depth of about 17 fathoms off Cullercoats.

Family—Eulimidæ.

Genus—Eulima.

E. bilineata (Alder).

One fresh but broken specimen dredged at a depth of about 17 fathoms off Cullercoats.

E. distorta (Da Costa) *v. gracilis.*

Three beautiful living specimens dredged at a depth of 39 fathoms, 16 to 17 miles off Souter Point, August 19th. This species is one of our rareties. Alder only mentions one specimen in his list, but later he dredged a few more.

Family—Muricidæ.

Genus—Trichotropis.

T. borealis (Brod. and Sowb).

One fine living specimen from 50 fathoms off Northumberland.

Family—Pleurotomidæ.

Genus—Pleurotoma.

P. attenuata (Mont).

One much worn specimen dredged at a depth of about 17 fathoms off Cullercoats.

P. costata (Penn).

Two specimens in shell sand, Newbiggin-by-the-Sea.

P. Trevelyana (Turton).

One specimen from 39 fathoms, 16-17 miles off Souter Point.

Genus—Defrancia.

D. Leufroyi (Michaud).

One much worn specimen, Berwick Bay.

D. linearis (Mont).

A few specimens dredged at a depth of about 17 fathoms off Cullercoats. One specimen from shell sand, Newbiggin-by-the-Sea.

Family—Bullidæ.

Genus—Cylichna.

C. cylindracea (Penn).

Several small specimens dredged at a depth of about 17 fathoms off Cullercoats.

Family—Bullidæ.

Philene scabra (Müller). Bullæa pectinata of Alder.

One live specimen, 40 fathoms, off Cullercoats.

THE MARINE AMPHIPODA OF NORTHUMBERLAND.

By ALEXANDER MEEK, M.Sc.

The following list of amphipods is presented as a preliminary one. There is a good deal of material still which I have not found time to examine. I feel, too, that a few of even the commoner species have been overlooked; but, on the other hand, some are recorded which appear to be very rare.

The work was much facilitated by Sars' splendid monograph on the Crustacea of Norway, the classification and nomenclature of which, with few exceptions (which are pointed out), are adopted. I beg to express my grateful thanks to Canon Norman for the interest he has shown in the preparation of this paper, for much help in identifying some of the species, and for kindly examining the proof and marking (*) the species of which he had no previous record from the north-east coast of England.

Tribe—Hyperidea

Family—*Hyperiidæ*.

Hyperia galba (Mont).

Male from surface, Druridge Bay, 8th September, 1896.

**Hyperoche tauriformis* (Bate and Westwood).

Young and adult specimens have been obtained nearly every year in the surface nets at the trawling excursions.

Parathemisto oblivia (Kröyer).

A few young examples were taken at the surface in Druridge Bay, 8th September, 1896, and in Skate Roads, 28th June, 1901.

Euthemisto compressa (Goës).

This form was taken in company with the Parathemisto at Druridge Bay on 8th September, 1896, and again in Cambois Bay, 11th April, 1898. It was got in 50 fathoms 25 miles out on 20th August, 1901.

Tribe—Gammarid.e.

Family—*Orchestiidæ*.

Talitrus locusta (Pallas).

Common on sandy beaches all along the coast.

Hyale nilssoni (Rathke).

Common amongst the rocks, especially under the little masses of mussels at Cullercoats and Whitley near high water mark.

Orchestia littorea (Montagu).

Beneath stones and seaweed at extreme high water mark at Cullercoats and other pebbly shores along the coast. One specimen, a female, off Cullercoasts, along with Bathyporcia pelagica and Paratylus swammerdami, on 31st May, 1899.

Family—*Lysianassidæ*.

**Acidostoma obesum* (Bate).

A number of specimens have been obtained from depths of 39 to 59 fathoms off Northumberland and Durham.

Hippomedon denticulatus (Bate).

Several specimens, young and adult, from 39 fathoms off Northumberland and Durham.

**H. propinquus*, G. O. Sars.

A few specimens, 39 fathoms off Northumberland and Durham.

**Tryphosella sarsi*, Bonnier.

Specimens obtained from Cullercoats and Beadnell in 1900.

Tryphosites longipes (Bate).

An adult female from 39 fathoms off Souter, and from near same station several juvenile specimens.

Family—*Pontoporeiidæ*.

Bathyporeia pelagica, (Bate).

Very common in sand in from 6 fathoms up to 40 fathoms.

Argissa hamatipes, Norman (= *A. typica*, Boeck).

Specimens from 40 fathoms.

Family—*Phoxocephalidæ*.

Harpinia neglecta, G. O. Sars.

Several specimens from 39 fathoms off Northumberland.

Family—*Ampeliscidæ*.

**Ampelisca spinipes* Bœck.

Specimens have been got from off Cullercoats and in 50 fathoms off Northumberland.

Ampelisca laevigata, Lilj.

Not uncommon in moderate depths.

**Ampelisca macrocephala*, Lilj.

In 39-50 fathoms off Northumberland.

Family—*Stenothoidæ*.

Stenothoe marina (Sp. Bate).

[One adult and two small specimens obtained near the Bass Rock, June, 1901.]

Metopa alderi (Sp. Bate).

One or two specimens from Alnmouth Bay, 1897 [and near Bass Rock, June, 1901].

Metopa pollexiana (Sp. Bate).

Obtained on two occasions off Cullercoats in 1899 and 82 miles E.N.E. Tyne in 45 fathoms [off Fair Isle in 54-5 fathoms.]

**Metopa rubrovittata*, G. O. Sars.

Several specimens from Cambois Bay, 1901.

**Cressa dubia* (Sp. Bate).

Specimens from off Cullercoats and elsewhere.

Family—*Œdiceridæ*.

Monoculodes carinatus, Sp. Bate.

One young specimen from near the Inner Farne Island, 22nd June, 1898.

Perioculodes longimanus (Sp. Bate).

This form has been obtained from Druridge Bay and also from 5-6 miles off Souter Point in 30 fathoms.

Synchelidium brevicarpum (Sp. Bate).

Specimens from near Inner Farne (1898, 1901), from Alnmouth Bay (1897), from Druridge Bay (1901), from Blyth Bay (1901), and from off Cullercoats (1899 and 1901).

Family—*Paramphithoidæ*.

Paramphithoe bicuspis (Kröyer).

45 fathoms, 82 miles E.N.E. Tyne.

Family—*Epimeridæ*

Epimeria cornigera (Fabr).

Berwick Bank in 27 fathoms, September, 1899, and 25 miles off in 50 fathoms, August, 1901.

An Epimeria, from near Fair Isle, differs somewhat from the above species:—Length, 10 mms. from rostrum to last spine of metasome; the long straight rostrum reaches to the end of the peduncle of the first antenna; the dorsal projections are not so prominent, and there is a small but distinct projection on the third segment of the urosome.

Family—*Iphimediidæ*.

Iphimedia obesa, Rathke.

One specimen from 59 fathoms off Northumberland, Aug., 1901.

Family—*Calliopidæ*.

Apherusa bispinosa (Sp. Bate).

Common in Cullercoats Harbour, and also where weed debris occurs all along the coast,

Calliopius rathkei (Zaddach).

Fairly common in Cullercoats Harbour and at other places along the coast. [It was also obtained in 1900 at Broughty Ferry.]

Family—*Atylidæ*

Paratylus swammerdami (M. Edwards).

This is the form, as was pointed out in the report for 1899, which is found so abundantly amongst weed everywhere along the coast, and it is got therefore in immense numbers in the nets and the boats of the fishermen during the salmon season.

Paratylus vedlomensis (Sp. Bate).

One specimen two miles off Cullercoats, September, 1899.

**Paratylus uncinatus*, Sars. [*falcatus* in Sars' Crustacea of Norway.]

This species is not uncommon on the sand beyond the rocks at Cullercoats and Druridge Bay, living in association with Cumacea, *Crangon fasciatus* and *Bathyporeia pelagica*.

The modified first pair of pereiopoda are used to grasp fragments of shell. Most frequently two pieces of shell are taken and grasped by the modified appendages. The animal has then the appearance of lying in a bivalve shell—the fragments of shell coming pretty close together dorsally. The active movements of the apparent bivalves betray, however, their crustacean occupants to the observer.

**Dexamine spinosa* (Mont).

Specimens have been obtained at Cullercoats and at Druridge Bay.

Family—*Gammaridæ*.

Amathilla homari (Fab.).

Amathilla angulosa (Rathke).

Both these species which Walker considers identical are fairly common at Cullercoats and elsewhere on the coast.

Gammarus marinus, Leach.

This species is common amongst the weed near to the coast and occasionally under stones.

Gammarus locusta (L.).

This form is very common all along the coast and can always be obtained under stones between tide marks.

Gammarus duebeni, Lilj.

Common in the Coquet about a mile from the mouth of the river.

Melita palmata (Mont).

[Several young specimens are present in a gathering made in the Tay at Broughty Ferry in September, 1900.]

Melita obtusata (Mont).

In 59 fathoms off Northumberland.

[Several specimens from the deep water off Fair Isle, 1899.]

Megaluropus agilis, Norman.

A few specimens from Cullercoats, Blyth Bay and Druridge Bay.

I have to thank Canon Norman for kindly referring me to his description of this species.

Cheirocratus sundevallii (Rathke).

A male was obtained off Cullercoats, 26th July, 1901.

Family—*Photidæ*.

Microdeutopis sp.

A female was obtained at Cambois Bay in August, 1901.

**Aora gracilis*, Sp. Bate.

Specimens from Holy Island harbour (1900) and from 2½ miles off Souter Point in 21 fathoms.

**Autonoe longipes* (Lilj).

A few specimens, Cullercoats, September, 1900.

Gammaropsis erythrophthalma (Lilj).

Common 2½ miles off Souter in 21 fathoms, and specimens also from 59 fathoms off Northumberland.

Photis sp.

25 miles east of Durham in 45 fathoms.

Podoceropsis excavata (Sp. Bate).

Several specimens from Cambois Bay, 28th August, 1901.

Family—*Podoceridæ*.

Amphithoe rubricata (Mont).

This species is common under stones and under the roots of laminaria all along the coast.

**Ischyrocerus anguipes* (Kröyer).

Two or three females obtained off Cullercoats in August, have 4 spines on the inner ramus of the 3rd uropod and a dorsal row of 3 or 4 spines on the telson, and therefore appear to belong to this species.

Ischyrocerus minutus, Lilj.

Fairly common in the harbour at Cullercoats and at other places on the coast. Obtained also from a piece of wreckage at Skate Roads.

Podocerus falcatus (Mont).

This species was got frequently from the harbour at Cullercoats and was obtained also at Craster last year.

Podocerus herdmani (Walker).

One male from Skate Roads, 22nd June, 1897.

Erichthonius abditus (Templeton).

One or two specimens from off Cullercoats.

Erichthonius hunteri (Sp. Bate).

In tubes 2½ miles off Souter in 21 fathoms. They measure—the males less the antennae—7-8 mms., and are therefore longer than those seen by Sars. Moreover, the carpal process is longer and reaches rather more than half the length of the propodos. Also from 82 miles E.N.E. Tyne in 45 fathoms.

Family—*Corophiidæ*.

Siphonoecetes colletti, Bœck.

This species is pretty common on the sand near to the rocks at the south end of Druridge Bay. While some of them agree with the description of this species others have gnathopoda more like *S. typicus*. The lateral processes of the cephalon, moreover, nearly reach to the end of the first segment of the lower antenna and are truncated distally. The following observations on the living animal may be interesting. I took one out of his tube and put him back into the water. He showed at first signs of helplessness, for *Paratylus uncinatus* was dodging about, but recovering to some extent he began to explore. Finding a tube containing a tenant slightly smaller than himself he got alongside and presented his antenna at the front entrance and the back entrance in rapid succession. This made the rightful inhabitant withdraw, but the would-be evicter after thus making a display remained quiet. The former then cautiously came out at the front door and not seeing the enemy withdrew himself from the tube so as to get a look behind. This was evidently what the latter was waiting upon. He suddenly plunged in at the back door and actually drove the poor proprietor out in front of him. At first this ill-used Siphonectes showed signs of trying the same tactics on a still smaller neighbour, but he proceeded instead to make a new tube. I next put two together into a small dish with only one

nest. One immediately entered into habitation, and the other tried his best to evict him, in his efforts dismantling part of the house but he did not succeed. On returning them to the dish containing the sand and loose small shells the houseless one quickly made a tube.

The tube was made as follows from small stones and shells. The first particle was caught up by the inferior antennæ—the small terminal spines aiding them in this function—and handed back to the gnathopoda. The animal was lying on its side and the particle was subsequently placed by the inferior antennæ on the exposed side of the body. Another piece was added ventral to this one after being provided with cement evidently from the mouth. The process was rapidly repeated the animal moving the connected pieces round to make room for the new ones, and latterly shifting its own position as the tube was being made. It was also by moving forwards in the tube, and adding particles to the anterior edge that the tube was completed. When finished it was tested by the animal moving out almost completely and then retreating and tucking itself in.

Frequently a largish piece of stone with a ready made tubular hole was chosen and only treated at the mouth with small additions to perfect it.

**Corophium bonelli*, M. Edwd.

One specimen off Cullercoats, 8th August, 1900.

Unciola crenatipalmata (Bate).

Near the rocks at Cullercoats, August, 1899.

Family—*Dulichiidæ*.

Dulichia monacantha, Metzger.

One specimen from 25 miles east of Durham in 15 fathoms on muddy sand. Got many years ago by Dr. Brady, whom I have to thank for this and many other specimens.

Tribe—Caprellidea.

Family—*Caprellidæ*.

Phtisica marina, Slabber.

Several specimens from 3 miles off Cullercoats.

Caprella linearis (L.).

Abundant in the near North Sea among Sertularians. On *Hydrallmania falcata* it is always obtained, and it is often very difficult to see the Caprella when it is hanging on to the branches of the zoophyte. It is larger from the deeper water.

FAUNISTIC NOTES.

By A. MEEK.

Two interesting fishes were sent from North Shields in August this year by Mr. R. Stevenson, viz., *Spinax niger*, the black dog fish, and *Chimæra monstrosa*, the "king of the herrings." Both were captured in the Pentland Firth. I have to thank Dr. Ridewood, of the British Museum, for identifying the first mentioned specimen. Both were females.

Mr. Douglas sent a specimen of *Scomberesox saurus*, the Saury or Skipper, from Beadnell in November.

A specimen of *Trygon pastinaca*, the Sting Ray, was handed in at the Laboratory, but we have not been able to discover how it was procured. Very likely it was picked up on the shore after the storm at the end of the year. We have another specimen which was trawled six miles off Creswell in December, 1897.

I have to thank Mr. Douglas for sending from Beadnell a splendid male example of the Velvet Swimming Crab, *Portunus puber*, *L.* It was recorded by Embleton for this district, but the record has been subject to doubt. This, happily, is set aside by the specimen now in our possession. Mr. Douglas says it is not uncommon near the Longstone.